Project Finance for the International Petroleum Industry

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Academic Press is an Imprint of Elsevier

Academic Press is an imprint of Elsevier
125 London Wall, London EC2Y 5AS, UK
525 B Street, Suite 1800, San Diego, CA 92101-4495, USA
50 Hampshire Street, 5th Floor, Cambridge, MA 02139, USA
The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, UK

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data
A catalog record for this book is available from the Library of Congress

ISBN: 978-0-12-800158-5

Publisher: Nikki Levy
Acquisition Editor: Scott Bentley
Editorial Project Manager: Susan Ikeda
Production Project Manager: Caroline Johnson
Designer: Ines Cruz

Typeset by Thomson Digital

Printed and bound in the United States of America

Table of Contents

Part II
The Petroleum Industry – Commercial Risks and Contracts

Introduction

This book is about raising finance for the international petroleum industry, an industry that represents one of the most important sectors in the modern world's economy. The activities of the petroleum industry span the globe and many of its products have become essential for modern society. At its core, the industry is about providing energy in the form of fuels, especially for transportation and electrical power generation. This is achieved by extracting and transporting raw materials from underground reservoirs, processing these materials into fuels and then delivering the final products to end-consumers in all parts of the world. This industry is, however, about more than just fuels. The hydrocarbon molecules that the industry extracts from the earth are also used to produce a wide range of other important materials. The petrochemicals industry produces the vast majority of synthetic materials including: plastics, polymers, synthetic rubbers, detergents, solvents and so on. The refining industry produces waxes, lubricants and bitumens. More specialist petroleum processes produce fertilisers, pharmaceuticals and other essential chemicals.

Although many of the products from this industry are now taken for granted, enormous investment has been made over many decades to enable the industry to produce and deliver these products to customers around the world. Continuous investment is essential to maintain the necessary production capacity and to expand the range of industry operations. In addition, as the industry has matured, the demands placed on it to operate in an environmentally and socially responsible manner have increased significantly. The costs of complying with these demands likewise requires enormous ongoing capital investment.

The goal of this book is to examine how the industry raises capital to grow on a global scale. More specifically, this book will explore how and why the industry uses project finance techniques to raise funding for its investment projects. Project finance is a method of funding whereby investors and lenders rely on the cashflows of a particular project to provide investment returns and to service debt. Project finance is used to fund projects in a variety of sectors and a major aim of this book is to demonstrate the flexibility of this method of raising capital and to show how this flexibility can be used to fund projects throughout the petroleum industry value chain.

A defining feature of the petroleum industry is the wide range of activities involved in the various sectors of this business. A key theme of the book is the varied nature of project risks and economics that confront lenders and investors in the industry. The success of project finance is largely the result of its ability to manage many different types of project together with the diverse range of risks and commercial structures encountered in the petroleum industry. As a result, this form of financing has been successfully applied to onshore and offshore oil and natural gas projects, LNG projects, shipping, pipelines, refineries, petrochemicals, storage projects and petrochemicals.

1 SCOPE OF THE BOOK

The petroleum industry is enormous and its activities extend over all regions of the world. Given the wide ranging nature of this industry, it is important to define the scope of activities which this book is concerned with. In theory, project finance can be used to fund almost any type of project and hence could be applied to the whole range of activities in the petroleum industry. In practice, however, project finance has tended to be used for large-scale projects in certain sectors of the industry. The following chapters will thus cover oil and gas development and production, LNG plants, refineries, petrochemicals plants, pipelines, storage facilities, shipping and offshore projects. Marketing and distribution of oil and gas is not addressed in any great detail, nor, apart from rigs, is the oil services sector. Given that there is considerable uncertainty in the exploration and appraisal for oil and gas, these activities are not usually suitable for debt funding, hence these activities are also not covered in detail. Finally, although power generation is relevant to the industry, project finance for power projects is a large subject in its own right and is not included in the scope of this book.

2 TERMINOLOGY

The petroleum industry has developed its own characteristics and distinctive vocabulary that can be a source of considerable confusion. The industry has Christmas trees, light ends, fairways, roughnecks, crackers, mud and strings to name but a few common terms. Even within the industry, terminology is inconsistent and, to add to the confusion, many terms have varying local usage and translation in different countries. Automobile gasoline (United States), for instance, is also called ‘petrol’ (United Kingdom), ‘essence’ (France), ‘benzin’ (Germany) and so on. As another example, ‘fuel oil’ is a generic term which could refer to a wide range of products. In general use the term covers the heaviest components from the crude oil distillation process. More specifically it could refer to certain grades of marine fuel (also called ‘bunker’ fuels) or to various other types of fuel used in industrial furnaces. In the former Soviet Union the term ‘mazut’ is often used to refer to these types of heavier fuels.

To further complicate industry terminology, many terms used in the industry are not scientifically accurate. This is a particular challenge in the chemicals sector where terms for industrial products are often not consistent with scientific classification. Ethylene oxide, for instance, is a common petrochemical used to produce antifreeze, plastics and so on. It has a variety of scientific names, including 'oxirane' (IUPAC[1] classification), 1,2 epoxy ethane and dimethylene oxide. This book is not, however, a scientific book and it is about more than just the petroleum industry. Important elements of finance, law, insurance and economics also underpin many aspects of the text. The aim of this book is to use common terminology as far as possible. Where there is potential for confusion, footnotes are included to refer to specific terms, language and vocabulary.

An area of particular challenge concerns the use of the word 'petroleum'. This is a generic name for hydrocarbon raw materials and products and is, in many ways, more accurate than the collective term 'oil and gas'. A core objective of this book is to demonstrate that project finance for the petroleum industry is much more than financing the development and production of upstream oil and gas. Project finance can also be applied to refineries, petrochemical plants, pipelines and storage tanks. The term 'petroleum' is a better descriptive word for the complete range of industry activities and hence is used in this book's title. Throughout the text, however, the terms 'petroleum' and 'oil and gas' are used interchangeably and should be read in this context.

3 STRUCTURE OF THE BOOK

The structure of this book is based on the need to firstly understand the unique characteristics of project finance and then to apply project finance tools and techniques to projects in the oil and gas industry. The book is divided into three parts. Part I examines the basic features of project finance in a general context. The importance of debt finance, lender risk analysis and project cashflows is highlighted and the sources of project financing reviewed. It will be seen that commercial contracts and risk allocation play a central role in project finance and hence Part II then goes on to look at the different sectors of the oil and gas industry and, more specifically, the risks, commercial structures and contracts typically found in the different sectors of the industry.

Finally Part III uses the general concepts of project finance and applies these to oil and gas projects. Lender risk analysis and cashflow forecasting is examined in detail followed by financial structuring and project finance documentation. The aim is thus to take the reader through each stage of the project financing process as applied to the wide range of different projects in the industry.

1. IUPAC is the International Union of Pure and Applied Chemistry which, among other activities, aims to bring standardisation to the chemical sciences.

Part I

Introduction to Project Finance

The objective of Part I of this book is to provide a general introduction to project finance and to explain the role of this financing technique in the context of the wider global financial markets. Project sponsors are usually confronted with a range of financing options when seeking to raise funds for their projects. It is, thus, important to understand how finance is raised generally for projects and then move on to explore the types of circumstance when project finance is chosen as the preferred option.

To see why project finance is used as a funding technique for oil and gas projects, it is firstly necessary to explain what project finance actually means. This form of financing is based on the concept of lenders providing debt to a specific project and does not rely solely on the corporate resources of the sponsors or the underlying value of the project assets. Lenders therefore place a significant degree of reliance on the performance of the project itself and, as a result, they will spend a considerable amount of time examining the viability of the project and its sensitivity to adverse risks. Chapters 1 and 2 will explore the characteristics and features of project finance and how the involvement of lenders in projects can influence corporate, commercial and financial structures.

It is important to examine which institutions are involved in providing funds in the project finance market, as well as understanding the basic principles of project finance. These institutions influence the structures and terms of project finance transactions to a significant degree and sponsors looking to raise project finance will need to understand the nature and dynamics of the project finance markets. Chapter 3 describes the main characteristics of this global market. It will be seen that international commercial banks and the syndicated loans market play a central role in oil and gas project finance. Chapter 4 will thus cover in more detail the role of commercial banks in the project finance markets. Many of the features of project finance are derived from the wider global syndicated loans market and hence the features and functions of this market will also be examined.

The four chapters of Part I will lay the foundations upon which can be built the application of the funding technique to the oil and gas industry. Having understood the importance of lender reliance on project cashflows to pay interest and repay loan principal, the need to understand project risks and contractual structure should become clear. Part II will then lead in to a more detailed examination of the risks and contracts which are typically encountered in the various segments of the international petroleum industry.

Chapter 1

The Characteristics of Project Finance

Chapter Outline

1.1 INTRODUCTION

Project finance is a funding technique that looks to the cashflows generated by a project to provide investor returns and lenders' debt service. There are a number of core principles that characterise this form of financing and, once understood, these can be applied to raise capital for almost any type of project. The purpose of this chapter is to describe these characteristics in general terms and explain the principles which underpin this method of financing. These general concepts can then be applied more specifically to project finance for the petroleum industry.

Section 1.2 reviews the options and decisions faced by the sponsors of large projects when seeking to raise capital to develop their schemes. There are many potential sources of funding for projects and the different options can have a significant impact on project economics and viability. Project sponsors will therefore want to carefully assess the advantages and disadvantages of all the possible funding combinations.

Section 1.3 then moves on to consider how project finance is used to raise capital for projects and the core principles which form the foundations of this method of funding. It will be seen that two core activities lie at the heart of the project finance process, namely: the analysis of project risks and the forecasting of project cash flows.

Section 1.4 covers in more detail the importance of debt in project finance and the methods used by project lenders to analyse and assess project risks. The concept of 'bankability' is introduced as well as the methods used in project finance to mitigate project risks to an acceptable level.

Section 1.5 explains the importance of the quantitative analysis of projects particularly project cashflows and capital structure. The various debt coverage ratio measurements are introduced together with the use of these ratios in the financial structuring process.

Finally, having looked at the most important components of project financing, Section 1.6 moves on to examine the processes which are usually followed to structure, execute and complete project finance transactions.

1.2 RAISING FINANCE FOR LARGE PROJECTS

Capital investment is a vital economic activity and represents an important constituent of the world's economic output. According to conventional economics, insufficient investment in a nation's capital stock will result in falling economic output and ultimately a poorer society. Investment is therefore nationally important and governments attach great political significance to capital spending on infrastructure projects such as roads, airports, energy infrastructure and so on. Despite the economic and political importance of capital investment the amount spent by different countries is highly uneven. Globally, an average of around 30% of the GDP is spent on capital projects. This varies, however, from a low of as little as 10% to a high of over 50% of GDP. In the United States, for instance, capital investment by the private sector totalled around US$ 3,000 billion in 2014 representing approximately 18% of GDP.

Governments have traditionally played an important role in capital investment either directly through the public sector spending or indirectly through the state funding of capital projects. In many centrally planned economies, for instance, capital investment has traditionally been undertaken almost exclusively by the state with little participation from the private sector. During 1980s private companies started to play a much greater role in many parts of the economy which had previously been managed by the public sector. In parallel, private finance also started to replace central government funding of capital projects, which had traditionally been financed through taxation and borrowing. This trend towards higher private sector involvement in the capital investment and financing is largely responsible for the rapid growth of project finance in the period following the initial 1980s privatisations.

Whether the public or private sector is responsible for capital spending a proper assessment should be made of the need for the investment. A variety of tools and techniques are commonly used to assess the attractiveness of investment opportunities and this process of assessment and selection of investment projects is known as 'capital budgeting'. Capital budgeting makes use of various investment appraisal methods, which typically rely on the assessment of the profitability of opportunities after taking account of the time value of money.[1] The project cash flows are discounted at an appropriate rate, after which a variety of parameters are calculated to guide the investment decision. A more detailed discussion on these investment appraisal parameters is provided in Chapter 2.

Once a decision has been made to invest in a project, finance has to be raised to pay for the investment. Huge sums of money are involved in capital investment, and finance thus plays an essential role in ensuring the long-term capital sustainability of a nation's economy. Like any procurement activity, raising finance for large projects involves selection between alternatives, careful planning and a thorough knowledge of the available options. For most viable investment opportunities there is usually a wide variety of financing options, project finance being only one of a number of alternatives. The reasons for using project finance to fund capital investment will be explored further in the following section.

The discussion so far has concerned capital investment at a general level. The international petroleum industry is one of the most capital-intensive sectors of the global economy and enormous investment is required just to maintain existing levels of production of petroleum products. The projected capital spend by the industry over the next decade is estimated to be US$ 700 billion per annum with the largest companies in the sector having annual capital budgets in excess of US$ 30 billion just by themselves. For the vast majority of projects in the oil and gas industry finance is provided from internal sources or corporate level funding. These more traditional sources of finance are examined in more detail in Section 14.3.

1.3 USING PROJECT FINANCE TO RAISE CAPITAL

In the previous section it was shown that finance plays an essential role in successful long-term investment and that sponsors of large capital-intensive projects are faced with a wide range of different financing options. We will now move on to consider the role of project finance and the reasons why sponsors may or may not choose this form of funding. It is important to start by defining project finance and understanding its features and characteristics. It is then possible to explain the circumstances which make project finance a viable funding option. Although project finance is a highly flexible form of funding which can in theory be applied to any type of project, in practice it is expensive and time consuming. The benefits of using project finance must outweigh the costs and this section will conclude with an analysis of the advantages and disadvantages of using project finance.

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1. The time value of money is a fundamental concept in finance and in essence is based on recognising the fact that money in the present is more valuable than money in the future.

It is difficult to precisely define project finance. There are no general or standard project finance structures that are applied consistently to all transactions. Instead structures vary according to the specific characteristics and risks of particular projects. Likewise, there are a variety of definitions of project finance each differing to a greater or lesser degree in emphasis and scope. The following statement from the Basel Committee on Banking Supervision[2] provides a concise definition and embraces the most important features of project finance.

> *Project finance may take the form of financing of the construction of a new capital installation, or refinancing of an existing installation, with or without improvements. In such transactions, the lender is usually paid solely or almost exclusively out of the money generated by the contracts for the facility's output, such as the electricity sold by a power plant. The borrower is usually an SPE (Special Purpose Entity) that is not permitted to perform any function other than developing, owning, and operating the installation. The consequence is that repayment depends primarily on the project's cash flow and on the collateral value of the project's assets.*

This definition includes two important concepts that require further explanation. Firstly, lenders are '…usually paid solely or almost exclusively out of the money generated by the contracts for the facility's output…'. Lenders will thus spend a considerable amount of time analysing both the projected project cashflows and the risks associated with these cashflows. Given that contracts generate the project cashflows, lenders will also closely scrutinise the terms of the various project contracts. Furthermore the definition states that the lenders are paid solely or almost exclusively from the project cashflows. It is important to realise, however, that certain risks to the cashflows may not be acceptable to the lenders either outright or without lenders charging an excessive margin. In this case other parties, including the project sponsors, may be required to provide some form of recourse to the lenders. The manner of support and nature of the final structure of the project financing are normally tailored specifically to the project and it is thus rarely possible to replicate structures project by project.

Secondly, because '...the borrower is usually an SPE (Special Purpose Entity) that is not permitted to perform any function other than developing, owning and operating the installation…' the lenders will normally want to assume a high level of control over the borrower's activities and the project itself. Lenders typically impose onerous restrictions on the financial and business activities of the borrower. Because of the importance of the project contracts, for

2. The Basel Committee on Banking Supervision is a committee of banking supervisory authorities that was established by the central bank governors of the Group of Ten countries in 1974. This committee provides a forum for regular cooperation on banking supervisory matters. Its objective is to enhance the understanding of key supervisory issues and improve the quality of banking supervision worldwide.

instance, lenders will be especially concerned to ensure that contract terms are not changed and, more importantly, that project contracts are not terminated. Furthermore, lenders typically control project cashflows by putting in place a complex structure of bank accounts that ensure cash is directed according to pre-agreed mechanisms.

These general project finance principles result in a number of common features that characterise this form of finance and serve to distinguish it from other types of financing.

- *High levels of debt*: Borrowers are able to tailor the financing structures closely to the project cash flows allowing high levels of debt to be incurred by the project company. This is especially apparent when a project generates stable and predictable cashflows.
- *Long tenors*: The tenors for project finance debt are usually much longer in comparison to corporate finance debt. This is also largely due to the ability to closely match the financing terms to the long-term cash generating ability of most projects.
- *Limited lender recourse to project sponsors*: Given that project finance lenders are primarily looking to the cashflows generated by the project for the repayment of their loans, the sponsors of a project are less exposed to the debt obligations. This 'non-recourse' nature of project financing is a significant advantage compared to other forms of financing.
- *Extensive project appraisal*: The financing process involves a significant level of scrutiny by lenders into the project risks and impact on cash flows. Lenders rely on extensive investigation work by external experts and consultants.
- *Considerable legal documentation and investigation*: The need to understand the effectiveness of the complex network of commercial contracts and the regulatory environment within which the project operates means that a significant level of input by legal experts is required. The legal work for project financing is usually far in excess of that required for other types of financing. In addition to a comprehensive and voluminous amount of commercial documentation, the finance documentation is also extensive and many of the terms are specifically negotiated for each particular project. The financing structure will need to document detailed covenants, security structures, bank account controls, agreements between different groups of creditors and the detailed mechanisms for the management of large bank groups or syndicates.
- *Reliance on complex financial modelling*: Project finance decision-making and analysis is heavily reliant on cash flow forecasting techniques and the use of large and complicated computer models. In contrast, financing which relies on corporate risk is more typically reliant on balance sheet analysis, historical performance and management capability.

Although high debt levels, long tenors and the limited recourse nature of project finance are attractive to project sponsors, these characteristics come at a cost. Project finance is time consuming and expensive. The lender controls are onerous and the involvement of project lenders can result in a more conservative commercial structure than would otherwise have been agreed. When considering the use of project finance, therefore, project sponsors will want to ensure that the benefits outweigh the costs. In particular the sponsors will want to ensure that the level of risk transfer and the extent of sponsor recourse are worth the additional cost associated with the higher lending margins, reduction in sponsor control and a more conservative financial structure.

The aforementioned principles and features of project finance apply to all industries and sectors. Turning specifically to the oil and gas industry it will be seen in later sections that project finance has been successfully used to raise funding for projects in this industry and has been an important source of funds in the development of many of the largest and complex oil and gas development projects. The high levels of debt that can be raised makes project finance an especially attractive funding option for project sponsors that are constrained in their ability to access corporate funding. It is often the case, for instance, that national oil companies will seek to use of project finance for their development projects in order to reduce the burden on state finances.

In the private sector, smaller project sponsors with limited availability of corporate funds often have no choice other than to raise financing on a non-recourse basis using the project assets and cashflows to raise the finance. In contrast, larger and financially stronger sponsors, especially many of major oil companies, are much less constrained in their funding options. For these companies the costs of project finance especially in terms of higher funding cost, more onerous lender intervention and loss of control outweigh the benefits and hence project finance is often one of the least preferred options. Although the major oil companies have often been seen using project finance for some of the largest projects in the industry, this is often due to pressure from other joint venture parties, especially national oil companies. In fact, many of the major companies have highly sophisticated and experienced in-house project finance teams. In this way, in addition to offering host governments technical and operational expertise, the majors are able to offer substantial project financing expertise.

1.4 RISK ANALYSIS AND RISK MITIGATION

Project risk analysis lies at the very heart of project finance. In the context of project finance, risk represents the likelihood that project cash flows will vary compared to original forecasts. The sponsors of a project are seeking to raise as much debt as possible to finance project costs. In addition, it is the project sponsors who will be managing the project and it is they who will benefit if the project performs better than expected. In contrast, lenders returns are fixed at the outset and hence the lenders to a project will normally take a more conservative approach to project risks. A successful project financing is only possible, therefore, if the project risks are acceptable, or ‘bankable’, to lenders. Oil and gas projects are exposed to a particularly diverse range of factors, which can influence project cashflows and to raise finance in this industry, it is essential that project sponsors understand how lenders approach risk analysis and risk mitigation. The following sections examine lender risk assessment, bankability and risk mitigation for project finance in general. In Part III, the bankability of petroleum industry risks will be specifically covered.

1.4.1 Lender Risk Assessment

Lenders will need to develop a detailed understanding of the project and then identify those risk factors which could have the most significant impact on the project's ability to repay the debt. The project cashflows that ultimately service debt are exposed to many risks and the larger and more complex the project, the wider the range of risks that need to be assessed by lenders. To bring some structure to the risk assessment process, project risks are normally grouped into a small number of categories.

- *Sponsor risks*: These are risks associated with the project sponsors including experience and competence of the sponsors, sponsor credit-worthiness and the risks relating to any joint venture arrangements.
- *Country and political risks*: These risks relate to the location of the project and the political and economic environment within which it will be developed and operated.
- *Completion and technical risks*: The risks which could result in cost overruns, schedule delays or performance shortfalls due to poor development, innovative technology and so on.
- *Operations and maintenance risk*: These risks relate to increased operating costs or production shortfalls resulting from poor project management, unforeseen circumstances, the performance of third-parties and so on.
- *Sales and market risk*: The risk related to the viability of the market into which the project will sell its product and particularly those risks associated with sales volumes and product prices.
- *Supply risks*: The risks associated with procuring the necessary inputs to the project including feedstocks, utility supply and reserves base. Supply risks can also be divided into volume and price risks.
- *Regulatory and environmental risks*: These are the risks that project economics could be impacted by regulation or environmental impacts.

The process that lenders go through to perform their detailed assessment of project risks is called 'due diligence', a process which forms a critical element of lenders' credit assessment for project finance transactions. To undertake this due diligence exercise, lenders usually engage a variety of third-party experts, consultants and advisors. These third-party consultants will undertake an extensive investigation of the project and report to the lenders on the acceptability of project risks. The workload required to manage this due diligence process can be extremely onerous and project sponsors will need to ensure that they are properly organised and prepared for significant lender involvement in the early stages of project development. This risk assessment process does, however, lie at the heart of the project financing process and usually results in a vitally important summary risk matrix that identifies the major project risks, and summarises the likely impact of these risks and identifies risk mitigation measures. The results of the assessment matrix are often used to score project risks and rank individual projects on the basis of the lenders' institutional risk assessment guidelines. As a result, the due diligence process is a vitally important component of lender credit approvals and will often determine capital allocation, transaction profitability measurement and various triggers to determine the level of monitoring needed for a particular exposure.

The focus so far has been on lender risk analysis. It should be understood, however, that the project sponsors also undertake their own detailed analysis of project risks. The risk analysis undertaken by the project sponsors will usually form the basis of lender credit assessment. It is important for project sponsors to understand that lenders will want to fully understand the level of risk to which they will be exposed and that the lenders' criteria for assessing risks may be quite different compared to the sponsors own assessment. Significant time and cost can be incurred in developing a project structure based on a project risk profile, which turns out to be unacceptable to lenders. At best the project finance structure may have to be re-developed. At worst the project may fail to raise sufficient finance and hence need to be abandoned.

1.4.2 Project Bankability

The concept of 'bankability' is fundamentally important in project finance. The term can be applied at a variety of levels but overall, a project risk is bankable if 'lenders are willing to finance it' (European Investment Bank, 2015). Bankability is therefore a generic concept which is intended to encapsulate whether individual risks will be accepted by lenders and, taken in its entirety, the overall risk profile of project is satisfactory for the purposes of raising debt finance. Determining whether risks are bankable is a difficult exercise and requires considerable experience and knowledge of institutional risk appetite. The concept is not uniform and some institutions may accept risks that others will not. This is especially the case when institutions consider wider issues such as general sponsor relationships or the potential for a large export contract. The risk appetite of institutions also changes over time. This is particularly true for country risks where jurisdiction, can rapidly become 'unbankable' due to political events such as wars, embargoes, economic crisis and the like.

There are many examples of unbankable risks which have prevented or seriously hindered the ability of sponsors to raise project finance debt. Compliance and sanctions risks, technology risks and completion risks have all contributed to financing challenges for specific projects. Lenders may not be able to transact with particular borrowers or in particular jurisdictions due to regulatory restrictions, sanctions and so on. Compliance regulations cover many aspects of project finance including customer identity, money laundering and bribery and corruption. These compliance matters are often complex and onerous and can prohibit lenders from entering into any transactions with entities caught by these rules. Furthermore, lenders are usually unwilling to accept the risk of new technology and project completion. First-of-a-kind technology or significant scale-up from existing technologies is often unacceptable to lenders. This is covered in more detail in Section 15.4.2. The risks associated with the environmental impact of projects can also prove difficult for lenders to accept. Unless project sponsors manage environmental risks in accordance with the requirements of lenders then it will be virtually impossible to raise project finance.

Throughout the project financing process it is vitally important to understand the significant difference in risk perception between lenders and project sponsors. As we have seen, project sponsors and providers of equity share the benefit from improved cash flow performance of the project but lenders do not. In addition, lenders are fixed to a contractual repayment schedule, which can only be accelerated if certain defined events occur. Lenders will therefore tend to take a more conservative approach. An example in the oil and gas sector is lenders approach to the bankability of reserves risks. Sponsors may want to follow a considered development of certain reserves. The lenders will, however, typically resist significant exposure to unproven reserves risk and hence a project based on unproven reserves development may be unacceptable to lenders and need to be re-worked to ensure bankability.

1.4.3 Risk Mitigation and Project Contracts

There are a variety of methods that can be used in project finance transactions to mitigate project risks. The most straightforward approach is to remove the risk entirely. An example of this would be the selection of proven, as opposed to unproven, technology. Alternatively, risks can be transferred to third parties through legally binding commercial contracts. This is one of the most important and common risk mitigation methods in project finance and, indeed, commercial contracts usually form the basis of lender credit risk assessment. Project sponsors should therefore be prepared for an extensive and often intrusive investigation exercise, which will be undertaken by the lenders, their lawyers and advisers on the project contracts. In addition to mitigation through project contracts, other risk techniques include: insurance, financial guarantees from third parties, cash reserves, financial instruments and derivative contracts.

A distinguishing feature of project finance transactions is the level of commercial contractual detail and complexity. Project borrowers normally enter into a variety of key contracts and many subsidiary contracts. Given that these contracts can involve substantial monetary exposure (both income and expense) and that they often determine the characteristics of the project cash flows, lenders spend a great deal of time understanding the rights, obligations and legality of the various clauses in a contract. Typical key project contracts include: construction contracts, offtake contracts, feedstock supply contracts, operations and maintenance agreements and enabling contracts (licences, concession agreement and production sharing agreements). A generic contract structure diagram is presented in Figure 1.1.

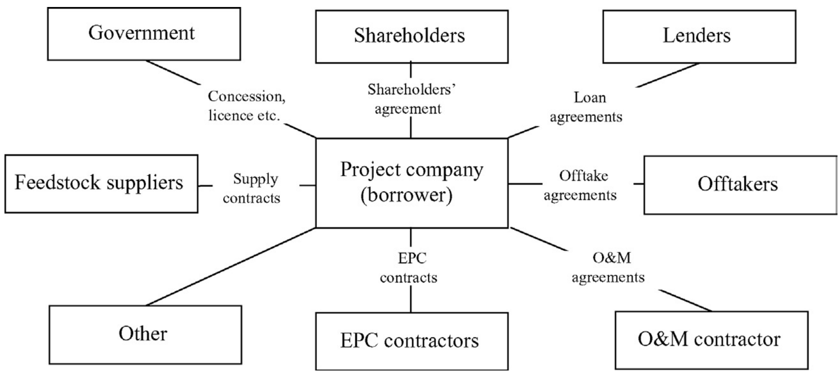

FIGURE 1.1 Generic project finance contractual structure.

The project company will enter into a number of long-term project agreements and will thus be situated at the centre of a network of project contracts. Feedstock suppliers and product offtakers often enter into the most important commercial arrangements with the project company. Host governments are also often involved in commercial contracts with the project company and may be required to provide assurances to the sponsors and lenders covering the legal and administrative framework for the project.

Although risk analysis and risk mitigation involve a significant element of qualitative analysis, the negotiation process with contract counterparties relies to a considerable extent on the quantitative assessment of risks on the project cashflows. If, for instance, a project is subject to the risk of feedstock interruption then it will probably be necessary to conduct a quantitative assessment of the financial impact of an interruption. This would rely on analysis of likely scenarios with financial impact assessment. Once the magnitude of the risk has been assessed methods of mitigation can then be negotiated with contract counterparties or project sponsors.

1.5 PROJECT ECONOMICS, CAPITAL STRUCTURE AND DEBT CAPACITY

Detailed forecasts of project cashflows and the assessment of the economic viability of projects are essential building blocks of the project finance structuring process. Economic forecasts are used to determine the amount of debt which a project can safely incur and to investigate the project's ability to withstand lower cashflow generation. Together with the qualitative risk analysis referred to in the previous section, the analysis of project economics is used to determine the most appropriate capital structure and debt capacity for a particular project. To do this a variety of debt measurements are needed. The most common of these are the debt cover ratios, which are explained in the following section.

1.5.1 Capital Structure, Debt Capacity and Cover Ratios

The capital structure of a project financing refers to the amount of funding from different sources expressed as a proportion of the total investment requirement. Typically capital structure relates to the proportion of debt used to finance project costs and, expressed as a ratio, is more commonly termed 'leverage ratio' or 'gearing ratio'. This ratio is largely determined by the capacity of the project cashflows to service the required debt payments to lenders. The project cashflows will need to be sufficient to pay interest on the borrowed amounts outstanding and to repay loan principal as it falls due. Interest and principal together are called 'debt service' and it is the amount of debt service compared to the projected project cashflows that determines the project's debt capacity. Lenders use a variety of cashflow cover ratios to measure the appropriateness of debt levels. The forecasts of financial performance of a project are based on a set of detailed technical, financial, economic and market assumptions projected over the life of the project. These assumptions are typically used as inputs into a complex spreadsheet based computer model, which then generates a set of financial statements and a variety of financial performance measurements. A detailed examination of financial forecasting for oil and gas projects is provided in Chapter 16.

The lenders want to ensure that the forecast cash available in each period is sufficient to meet their interest and principal payments. The most common ratios that lenders use to assess the sufficiency of project cash flows are the debt service cover ratio and the loan life cover ratio. To illustrate the calculation of these ratios we will assume that a project generates a series of cash flows over a 10-year period at a constant level of US$ 25 million per year. We will also assume that the project takes out a US$ 100 million loan at 5% with a 10-year tenor and an annuity style, or constant, annual debt service requirement, which in this case equals US$ 12.95 million per year.[3]

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3. An annuity is a series of equal cashflows that are determined by applying a specified discount factor to a fixed capital sum at the beginning of the annuity period. These fixed cash flows are calculated by applying an annuity factor to the initial capital sum. Annuity factors depend on the assumed discount rate and the number of periods over which the cashflows are spread. An annuity factor formula or annuity factor tables can be used to derive these factors (or an excel spreadsheet). Assuming a 5% discount rate over 10 years gives an annuity factor of 1/7.7217.

Debt Service Cover Ratio

This is the ratio of the projects free cashflow ('cash flow available for debt service' or CFADS) to debt service over a defined period (usually 6 or 12 months). The following formula illustrates the calculation.

$$\text{DSCR} = \frac{\text{CFADS}}{\text{Debt service}} = \frac{25.00}{12.95} = 1.93$$

A cover ratio of one implies that there is just sufficient cashflow to service the contracted debt repayments and interest. If the DSCR is lower than one then this suggests that a project is in default. In the above calculation there is a reasonable level of debt service cover.

Loan Life Cover Ratio

This is the ratio of the net present value (NPV) of projected cashflows over the period of the loan to the principal amount of debt outstanding at the date of calculation of the ratio. The NPV of the projected cashflows is calculated by discounting the cashflows in each period to a common point in time and summing together the resulting present values. The discount rate used is the cost of debt. In the example given, therefore, US$ 25 million is discounted at 5% each year for 10 years given an NPV of US$ 193.04 million. The LLCR can therefore be calculated as follows.[4]

$$\text{LLCR} = \frac{\text{NPV of project cashflows}}{\text{Loan amount outstanding}} = \frac{193.04}{100.00} = 1.93$$

There are a number of variations on the LLCR concept the most important of which is the Project Life Cover Ratio (PLCR). This ratio uses the NPV of the cashflows over the life of the project rather than the life of the loan. Given that the life of most projects extends well beyond the life of the loan, the NPV is calculated over a longer period of time resulting in a higher numerator and hence higher ratio.

Cover ratios are used extensively in the structuring of project financing transactions. It can be seen from the calculations above that once the forecast net project cashflows have been established, the debt cover ratios are determined by the level of debt service in each period. The capital structure has a direct impact on the ratios through two key mechanisms.

- *The proportion of debt*: The more debt that is borrowed, the higher will be the debt service in each period and hence the lower the coverage ratios. Reducing project debt levels (and increasing the proportion of sponsor equity in the project) will thus increase the cover ratios.

4. Note that in this case the DSCR and LLCR are identical. This is because CFADS is constant and discounted at the same rate as the loan interest.

- *The tenor of the debt*: The more periods over which the loan is repaid, the lower the principal payments in each period. This translates into a lower debt service requirement and hence extending the loan tenor will increase the cover ratios.

In addition, the repayment profile of the debt will determine the principal and interest payments in each particular calculation period. Adjustments to the repayment profile will also influence the level of debt service in each period and hence will impact the cover ratios. Structuring a project finance transaction therefore requires skill and experience in determining an appropriate banking base case and then manipulating debt terms and debt payment profiles to arrive at an appropriate level of debt service coverage. Financial structuring and the use of cover ratios for oil and gas projects will be discussed in detail in Section 16.4.

1.5.2 Determining the Level of Cover That Lenders Require

The structure of a project finance transaction is clearly dependent on the level of cover that lenders require. If lenders are prepared to accept lower coverage ratios then the project cashflows will be able to support higher proportions of debt. A debt service cover ratio of 1.2 as opposed to 2.4, assuming all other assumptions remain constant, implies that a project could incur twice the amount of debt. It is therefore important to establish the level of cover which lenders will require for a particular project. There is unfortunately no definitive answer to this question and much depends on the characteristics and circumstances of the project being financed. It should, however, be clear that lenders will require higher levels of security for their loans for higher risk projects. Higher project risk means greater variability in project cashflows and higher required debt cover ratios needed to provide sufficient security if cashflows are unfavourably impacted by particular risks. The exact level of cover that lenders will require is dependent, therefore, on the lender analysis of risk and the impact of negative risks on project cashflows. This is a fundamental concept to understand and forms the link between the qualitative lender risk analysis, which was examined in Section 1.4, and the quantitative financial analysis using the forecast project cashflows.

1.5.3 Financial Structuring

Financial structuring involves the manipulation of the various constituent elements of a financing to achieve the best combination of terms (typically by selecting the structure which achieves the maximum amount of debt at the lowest cost). The aim of financial structuring is to achieve coverage ratios that are acceptable to the lenders while at the same time raising an appropriate level of competitively priced debt in order to maximise the returns to the project sponsors. This is not a simple exercise and involves the balancing of the often opposing objectives of the sponsors and lenders. The project sponsors are seeking to maximise the levels of debt whilst the lenders want to ensure that there is sufficient cover in the project cashflows.

An important goal in the development of financial structures is to match the debt service cashflows as closely as possible to the net cash flows generated by the project. This exercise is commonly termed 'debt sculpting' and involves adjusting the drawdown and repayment profiles of the loans to achieve the desired minimum cover ratio level. Debt sculpting is especially important when confronted with uneven or irregular project cashflows. A refinery project may, for instance, require major overhauls at pre-determined times. Major overhauls will result in both extended periods of shutdown (which will reduce revenues) and expenditure on maintenance. The cashflows available for servicing debt during these periods could, therefore, be significantly reduced. Debt sculpting can be used to reduce principal payments during these periods so that acceptable cover ratios can still be achieved during the period of lower cash inflows. Debt sculpting for oil and gas projects will be explored further in Section 16.4.

1.6 THE PROJECT FINANCE PROCESS

Project finance involves a set of complex activities and tasks including structuring and negotiating the financing, agreeing loan agreements, documentation and security structures, loan drawings and repayments and project finance monitoring. These activities and tasks all need to be carefully planned and managed and, even for smaller projects, this can be onerous and time consuming.

1.6.1 Project Finance Participants

One of the defining features of project finance is the broad range of parties involved in the structuring, negotiation and ultimate success of a transaction. In the more traditional types of corporate financing, the majority of negotiations and discussions are held on a bilateral basis between a small group of lead lending banks, the borrower and a variety of external advisers (lawyers, accountants and the like). In contrast, project financing involves lenders extending credit to a specially incorporated project company which generates cashflows primarily through third-party contracts. As a result, the number of entities involved in the financing is usually much greater. Each party to a project financing needs to understand the goals and objectives of the other entities involved. A successful project financing requires each party to ultimately agree to a set of commercial and financial contracts that are satisfactory to all. The structuring of a successful project financing is hence about the careful building of consensus positions between all the various parties to achieve an acceptable balance of risk and return.

Borrower and Project Sponsors

The borrower of project finance debt is usually a special purpose company (commonly termed the 'project company') whose business is restricted to developing and operating the project that is being financed. The project company is counterparty to the various project contracts and is thus, in theory, the entity that is ultimately responsible for managing the various risks to which lenders are exposed. In practice, however, the project company often does not exist until quite late in the development process. The project sponsors will usually be responsible for managing the initial phases of project development for a considerable period of time and many of the commercial negotiations will be conducted by the sponsors. This situation can create difficulties. The sponsors may become conflicted and there is then the danger that unbankable risks are left with the project company resulting in a financing structure that later needs to be renegotiated with lenders. It is important, therefore, that the project sponsors adopt a balanced approach to commercial negotiations and recognise that the project company will ultimately be responsible for managing the commercial risks and servicing the project debt.

Lenders

We will see later in Chapter 3 that for many projects the group of lending institutions extending credit to the project can be wide and diverse, especially for the larger projects. Although these lenders all share the common goal of being repaid loan principal on time together with a suitable return, the particular objectives of individual lenders may be quite different. Commercial lenders usually have wider relationships with the project sponsors. Government or quasi-government lenders, on the other hand, may have very specific objectives for funding particular projects including, for instance, the promotion of exports or the economic development of particular regions or sectors of the domestic economy.

Governments and Government Bodies

Large projects are usually nationally significant and governments are typically involved in development and operation in various roles. The government may be a major sponsor of the project either directly or through a state owned entity such as a national oil company. Governments may also be involved in projects through regulation and licensing. Government entities could enter into important project contracts, for instance, for the supply of feedstock, offtake of product or provision of infrastructure. Host governments may also need to provide various forms of support or guarantees to projects especially with regards to availability of foreign exchange, tax treatment of specific projects and other rights, which may be required to ensure that the project is a viable proposition.

Third Party Suppliers, Offtakers

Given the central importance of project contracts, the various contract counterparties to a project finance transaction play an important role throughout the project finance process. For many projects, the viability of the venture may be dependent on the long-term performance of a single contract counterparty. This is especially the case, for instance, when a project is reliant on a dedicated supply of feedstock pursuant to a single supply contract. Lenders will therefore usually want to establish direct contractual relationships with project contract counterparties normally by entering into direct agreements (see Section 2.4.3).

Contract counterparties may play other roles in the project. A national oil company, for instance, may be a project sponsor and shareholder, feedstock supplier and possibly even an offtaker. Many projects involve joint-venture partners providing licensed technology and technical services. Although not common in the oil and gas industry, EPC contractors may also have an ownership interest in a project. In situations such as this, there is significant scope for conflict of interest and careful management of the negotiation of contract terms is required.

1.6.2 Stages of Project Financing

Although each project finance transaction is unique and the approach to the project finance process is usually 'tailored' to the particular requirements of the project, there are a number of common stages and milestones which can be identified.

Stage 1 – Financing Definition: From Initial Concept to Lender Engagement

The aim of the first stage of the project finance process is to define the financial structure and usually begins with the appointment of a financial advisor. Financial advisors perform a vitally important role in project finance transactions and will usually undertake a study of the bankability of the project, advise on the most appropriate structure for the financing, develop a term sheet and financial model and produce a package of information (including detailed project due diligence) in preparation for a formal approach to potential lenders. Once the project has reached a satisfactory level of definition (including the commercial terms with contract counterparties) and the financing has been developed to a sufficient level of detail, potential lenders will be approached and asked to agree confidentiality terms prior to being provided with a full information package as part of a formal 'request for proposals'. Many large transactions in emerging markets involve government related financial institutions including export credit agencies (see Section 3.3.2). These institutions and agencies will usually be engaged early in the financing process and in many cases well before other potential lenders.

Stage 2 – Structuring and Negotiation: Through to Lender Commitments

The objective of Stage 2 of the project finance process is to obtain formal commitments from lenders to provide loans to the project. To achieve this goal the detailed terms of financing will need to be negotiated and agreed. The lenders will need to obtain their required approvals to lend and, finally, the lenders will agree to lend pursuant to legally binding commitment letters on the basis of an agreed term sheet. During this stage the lenders will undertake detailed due diligence on the project and will engage a variety of external consultants and experts to assist them in their analysis. In parallel the project will continue to evolve with further definition, negotiation of terms with contractors and refinement of budgets and development plans. Government permitting, licensing and approvals will also need to be progressed through this stage of the project financing.

Stage 3 – Documentation, Signing and Funding

The objective of Stage 3 is to achieve signing of the finance documents, approvals from equity investors and, finally, funding of project costs. In parallel the commercial agreements with all of the third party contractors should be completed and executed. The process through to funding involves the production of a set of legally binding finance documents from the committed term sheet. The sponsors will also need to go through their own internal approval processes to allow them to commit their own equity funds to the project. Once the finance documentation has been signed, the process will then move towards the first drawing under the loan agreements. The sponsors can only request funds from the lenders once certain conditions have been met and it is usual for the lawyers to continue to spend significant time, once the financing documentation has been signed, in collecting various documents, which are stipulated in the loan agreement.

Stage 4 – Monitoring and Managing: Project Completion and Debt Repayment

The project finance process does not stop at first drawdown. On the contrary, project finance is concerned with the funding of long-term projects and the sponsors and lenders are usually involved in the project for long periods of time. The monitoring and management requirements for project finance transactions differ between the operational and the construction phases. The lenders tend to require significant reporting on project progress during the construction phase and lenders representatives usually visit the site on a regular basis. The information flow during this phase tends to be project specific and technical in nature. Financial information is normally focused on the construction budget. During the operational phase the focus tends to be more on financial information, management accounting and ratio analysis.

The lenders to a project need to ensure that they are monitoring the project and the loan agreements will stipulate reporting requirements throughout the life of the loan. These reporting requirements can be onerous and will cover the exchange of information between the project and the lenders in areas such as: operational performance, financial performance and accounting information, environmental performance, etc. A particularly important phase of the project is completion. Once the project is complete and generating cashflows the borrower is then able to start servicing its debt, repaying the loans and paying dividends. Loan agreements usually include a variety of specific mechanisms which require particular care and attention. Many upstream financings, for instance, include mechanisms for determining the maximum size of permissible debt. These will be explored further in Section 18.2.4.

Projects inevitably face changing circumstances and amendments, waivers and restructurings of the financing may be required. In addition, once the project achieves commercial operations, the project sponsors often find that better terms can be achieved by refinancing the debt.

1.6.3 Project Financing Process Management and Timing

Given the complexities of the tasks and the diverse range of parties involved in project finance transactions, it is essential to ensure that the process is carefully managed. Furthermore, project finance transactions rarely move quickly to closure and the different phases can extent over several years. The time, resources and costs required to negotiate and complete a project financing should not, therefore, be underestimated.

Role of a Project Finance Advisor

Project financial advisors provide a range of services to various parties to a project financing. Although the traditional role of a financial advisor is to advise the joint venture sponsors throughout each stage of the project finance process, advisors also provide services to other parties to the transaction including specific advice to individual sponsors, advising export credit agencies or even some of the contract or government counterparties (offtakers, government departments and so on). A typical scope of work for a project financial advisor will usually include the following tasks.

- Development of a project finance model for forecasting project cashflows.
- Drafting of the loan term sheet.
- Assisting in the negotiation of project contracts.
- Developing a bankability study and advising on the most appropriate financing structure.
- Managing the lenders due diligence process and assisting in the selection and engagement of consultants.
- Preparing the information package for a lender request for proposals.
- Coordinating the solicitation of proposals from lenders and negotiating the terms for commitment letters.
- Negotiating documentation through to signing.
- Assisting with conditions precedent and first drawdowns of the loan.

A variety of institutions provide project finance advice including commercial banks, independent advisory firms and large professional services firms.

The usual practice is to select the most suitable firm following a tendering process, which is commonly referred to as a 'beauty parade'. Whoever acts as the advisor will be engaged on the basis of terms which cover: team composition, conflicts of interest, expenses, remuneration, termination and suspension and so on. Remuneration is generally based on regular (usually monthly) retainer payments and a success fee paid on first drawdown of the facilities.

The role of the financial advisor will usually terminate once first drawdown has been achieved. Given that the financial advisor accumulates a significant amount of knowledge on the project and the financing, it is not unusual, however, for the advisor to be re-engaged at a later stage. This may be required if the project requires further funding or decides to expand its activities or if some form of restructuring is required.

Timing of the Project Finance Process

The amount of time required to successfully complete a project finance transaction depends on many factors, not least the time required to conclude the non-finance tasks involved in the project development process. In addition to the project finance process outlined earlier, other tasks that are vital to the development of the project, will need to be managed and finalised. These tasks include: project design and engineering, selection and engagement of development contractors, obtaining the required approvals and authorisations from regulatory authorities, negotiation and finalisation of the principal project contracts including supply contracts, offtake contracts and contracts and licences for mineral rights. It is often the case that these non-financial project development activities cause delays to the financing and hence the timing of the project finance process is usually very difficult to estimate in advance and equally difficult to maintain.

In general, however, it very rare for a project financing to be completed in less than a year and for planning purposes it is normally assumed that the three stages up to financial close and first drawdown of debt will each take around 4 to 6 months. A total planning timeline of 12 to 18 months for a complex oil and gas project financing is not therefore an unreasonable estimate.

Chapter 2

Project Finance Structures and Techniques

Chapter Outline

2.1 INTRODUCTION

The previous chapter explained the importance of project finance risk analysis and cashflow forecasting. This chapter will now build on these concepts and examine the various structures and techniques that are commonly found in project finance transactions. The focus remains on generic project finance concepts that can be applied later to oil and gas projects.

Section 2.2 begins by looking at three important project finance structural features namely: corporate structures, commercial structures and financial structures. These features taken together usually define the characteristics of a project finance transaction and, once understood, can be used to compare different types of transaction structure.

Section 2.3 goes on to examine project finance funding techniques for debt and equity. Project sponsors are seeking to raise the maximum amount debt on the best possible terms. This section therefore starts with debt structures and then moves on to the various structures used to fund equity.

Section 2.4 describes the nature of lender security over the project assets, contracts, cashflows and so on. Project finance structures usually involve extensive and complex security arrangements that provide project lenders with significant legal rights over the project assets.

2.2 PROJECT FINANCE STRUCTURES

The structure of a particular project finance transaction can usually be described in terms of the type of borrower, the commercial philosophy and contracts that form the basis for the project and the composition and sources of finance used to fund project costs. The success of a project finance transaction is highly dependent on the ability to match the financing structure with the underlying risk profile of the project cashflows. A project that generates risky and volatile cashflows is unlikely to be able to support an aggressive financing structure. Although this seems self-evident, there are plenty of examples of attempts to finance risky projects with over-aggressive financing structures. Efforts to raise project finance in such cases generally fail, resulting in a need to revisit and restructure the basis of the financing. In the worst case, the financing exercise, or even the project itself, has to be abandoned altogether.

2.2.1 Corporate Structures

The basic corporate structure for a project finance transaction consists of a newly established, single purpose, incorporated project company that is legally and financially distinct from the project sponsors. Despite this being an apparently straightforward arrangement there are a number of issues that need to be carefully considered. Furthermore, projects are often financed on the basis of more complex arrangements involving, for instance, existing companies, unincorporated structures or several different borrowing entities. The choice of corporate structure is typically driven by sponsor requirements, especially tax and accounting arrangements, or by regulatory matters. These considerations may conflict with lender bankability requirements and thus need to be carefully thought through in the context of any particular overall project finance structure.

Single Purpose Incorporated Project Company

A newly formed single purpose project company will usually be established by the sponsors at or near to the signing of the finance documents. Being incorporated, this company will be legally separate from the project sponsors and will ideally own all of the project assets. Although tax, accounting and corporate governance considerations will influence the place of incorporation, the final choice of location is normally subject to various constraints. Local laws or specific requirements in agreements with governments often mean, for instance, that the project company must be locally domiciled. Wherever incorporated, the project company will normally enter into all the project contracts and will borrow the funds to develop the project. The lenders will want to ensure that the activities of the project company are restricted to the development and operation of the project and they will expect to exercise significant control over the borrowers' activities including: restriction on the use of borrowed funds, prohibition on activities not related to the project, restrictions on the project company entering into new contracts and incurring new debt, and so on.

The ownership of the project company is an important consideration in project finance. Most large projects are developed as joint ventures. The ownership and management of the project company is therefore typically governed by the terms of a shareholders' agreement between the joint venture partners. The shareholders' agreement will usually cover a number of important areas including the management of the company, methods of decision-making, equity contributions by the shareholders, termination events, shareholder transfers of interests and taxation and accounting issues. A common provision in shareholders' agreements concerns the ability of the shareholders to transfer their interest in the joint venture. The shareholders in the joint venture are likely to insist on pre-emption rights whereby the remaining shareholders are given the right to acquire the interests of any shareholder wishing to exit the joint venture. Although pre-emption rights are relatively standard in joint venture agreements they can cause complications in project finance structures.[1] The lenders are therefore likely to scrutinise any shareholders' agreement and seek to ensure that the terms of these agreements are consistent with the philosophy of the underlying project finance structure.

The sponsors of the project often make use of specially incorporated subsidiaries to act as shareholders in the project company. These intermediate investment companies may have limited financial resources and their financial obligations to the project company and lenders will normally need to be guaranteed by the parent company. A further complication may also arise if there is an intention to partially (or in some cases totally) list the project company on a public exchange. A public listing brings with it several important and challenging issues, which can have a significant influence on the financing structure. Public listing will be examined in further detail in Section 3.2.2.

The host government may have an ownership interest in the project company, typically indirectly through a state-owned entity. Oil and gas licence and concession holders are often obliged, for instance, to include the host government in the project ownership structure. The government stake may be a minority stake or the government may be the controlling shareholder. An important issue to be addressed when host governments participate in projects is the ability of the government to fund its share of the project costs. It is often found that the local entity representing the state's interest in a joint venture has limited funds. For large oil and gas projects, funding the obligations of these local entities can be a serious challenge.

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1. It will be shown later that lenders normally expect to agree detailed restrictions with the project borrower on the ability of shareholders to transfer their interests in the joint venture. Pre-emption rights and other terms of the shareholders agreement can conflict with these restrictions.

Variations on the Traditional Model

The single purpose incorporated project company structure is, in practice, often found to be either highly unfavourable or impossible to achieve. Project loans may, for instance, be made to borrowers with existing operations or to unincorporated joint venture partners. Furthermore, certain project activities may be carried out by wholly or partially owned subsidiaries of the project company.

- *Existing project companies*: Although a 'pure' project financing involves the development of a greenfield[2] project, in many cases the borrower may have some form of existing operations and operating history. Furthermore, for a variety of reasons, the project development process may be well advanced before project finance is utilised. In these cases, rather than the project company being newly established specifically for the project financing, an existing and sometimes quite sophisticated corporation may be used to borrow the funds.
- *Unincorporated joint venture*: An unincorporated joint venture is a contractual (as opposed to corporate) arrangement between the joint venture partners. There is no separate legal entity and, hence, there is no project company that is able to borrow funds. Each joint venture partner will normally fund its own contributions to the joint venture through a 'cash calling' mechanism. Unincorporated joint ventures are especially common in the oil and gas industry and are examined in more detail in Section 6.4.2.
- *Borrower subsidiaries*: The restriction of the project company's activities has already been discussed earlier. In addition to preventing the project company from undertaking activities other than the development and operation of the project, these restrictions also typically prevent the company from establishing subsidiaries. It is, however, often the case that certain project activities are carried out in a separate company wholly or partially owned by the project company. A number of LNG projects, for instance, procure shipping services using dedicated shipping subsidiary companies. Host governments may insist on the project company establishing subsidiaries for certain infrastructure projects such as export port facilities. Subsidiaries may also be established for marketing and distribution activities. Given that lenders will not usually have a direct lending relationship with these entities, they will want to ensure that the legal, commercial and financial arrangements are transparent and acceptable and do not present a significant risk to the project company's cashflows and risk profile.
- *Shared facilities*: Closely related to the issue of subsidiary and associated companies are the arrangements for shared facilities and infrastructure. It is often found that the most efficient method of developing project infrastructure is to share facilities with other parties. These arrangements can add significant complexity to a project financing.

2. 'Greenfield' in the context of project finance means a project, which does not involve any previous or historical development work or activities.

The final complexity to deal with concerns the situation whereby a project company borrows funds and on-lends a proportion of these funds to an associated entity to fund the costs of another part of the project. Whilst this arrangement appears to be unwieldy and probably unnecessary it is, in fact, often encountered in oil and gas project financing. A situation may arise, for instance, whereby an upstream gas development project is being managed by an unincorporated joint venture whilst gas processing is handled by a separate incorporated entity. Although the ownership of the various entities in the project is often quite different, the ultimate sponsorship is consistent along the project value chain. In this case the incorporated gas processing entity may borrow all the funds for development and on-lend a portion of these funds to the upstream joint venture partners. This arrangement can raise challenges and will be dealt with further in Section 17.4.1.

2.2.2 Commercial Structures

The commercial structure of a project finance transaction refers to the network of contracts between the project company and various third parties for the development and operation of the project. The commercial structure ultimately determines the risk sharing and bankability of the project and has been introduced earlier in Chapter 1. The purpose of this section is to consider some of the considerations concerning the design of the commercial structures of projects. Before looking into the detail of the project contracts, however, it is important to understand the rationale for the project, whether the project is ultimately a viable proposition and then the underlying commercial philosophy that the project sponsors have adopted.

Project Rationale and Viability

The project rationale is the basic justification for the project and aims to answer the question 'why is this project needed'? Although a project may have a strong justification it does not necessarily follow that the project is economically viable. Project finance lenders will therefore want to ensure that they fully understand not only the rationale for the project but also its economic viability in the long term. Sponsors of projects will need to demonstrate that there is sufficient demand for the project's output and that the project is cost competitive. As an illustration, the viability of natural gas projects is particularly dependent on access to a market for the gas. Although the development of a large gas field may be justified on the basis of the size of the discovery, without competitive access to a market for the gas the project is unlikely to be economically viable.

Sponsors of projects with strong project economics should have easier access to funding and a wider range of financing options. Projects with weaker economics can find funding much more difficult and raising finance is often a significant constraint on the feasibility of the project. Host governments may, for instance, have political reasons for developing projects and these can often override commercial viability. If the project relies on a significant level of subsidy then the likelihood that these subsidies remain for the term of the project has to be seriously questioned.

Although a project may initially be viable, changes to the economic environment can undermine project economics. Cost inflation, lower commodity prices and political changes derail projects. The concept of project viability is not, therefore, static and lenders are aware that apparently highly attractive projects can rapidly become untenable as the environment changes.

Project Philosophy and Underlying Commercial Deal

Assuming that the project is viable and has a sound underlying rationale, it is then necessary to consider the best way to structure the commercial arrangements of the project. An almost limitless range of commercial structures could in theory be adopted for any particular project depending on the risk appetite of the various project counterparties and the cost of transferring risks through commercial contracts. The commercial philosophy of the project is thus concerned with the acceptability of specific risks to the various project parties and the extent to which the project economic gains are transferred to these parties in return for accepting those risks. Risk averse sponsors may, for instance, seek to contract the greatest level of risk away from their investment. The philosophy for such a project would involve the sponsors seeking contract counterparties to manage as much risk as possible. A refinery project, for example, may be developed by sponsors with good operational and development expertise but who are not prepared to take refinery margin risk. In this case the project sponsors would seek offtake and supply contracts which would to the greatest extent possible transfer these risks onto a third party.

Contractual Structures

The commercial deal which underlies the project financing is reflected in the detailed terms of the project contracts. The contractual arrangements determine the allocation of risks between the various parties and ultimately determine the cost of risk transfer. The basic principle of contracting is that risks should be allocated to those best able to manage them. Contract counterparties will however only accept risk in return for being properly remunerated and the more risk transferred, the higher the cost. Project lenders will therefore want assurance that risks are efficiently transferred to the most appropriate contract counterparties.

There are a number of contracting arrangements that have been developed in the oil and gas industry which are unique to the sector. Lenders providing project finance to oil and gas projects will need to understand the nature of these contracts as they determine the risk allocation mechanisms inherent in these types of project. The purpose of Part II is to examine in much greater detail the specific contractual arrangements that govern each part of the value chain. It is also important in project finance transactions to ensure that the interaction between the various different project contracts results in consistent risk allocation. If contract terms are inconsistent then unacceptable risks could be left with the project company. A gas supply contract to an LNG plant may, for instance, allow the gas supplier to suspend supply for unforeseen sub-surface issues. If the project company is not relieved of its obligation to supply the LNG pursuant to its sales contracts then risks are mismatched. This situation could create significant financial problems for the project company. It is not surprising, therefore, that project lenders and their advisors will spend a considerable amount of time ensuring that the terms of the various project agreements are consistent in terms of risk transfer and allocation.

2.2.3 Financial Structures

We have seen that corporate structures for project finance are based on the development and operation of the project by a special purpose project company. The commercial structure of the project will define the risk allocation between the various parties and the project company will enter into a variety of project contracts to document the agreed allocation of risks. Finance for the project is then structured in the context of this corporate and commercial framework. The structuring of the financing for the project is concerned firstly with how much of the project should be funded by borrowed money and secondly with ensuring that the best terms are negotiated with the project lenders. The financial structuring decisions are of fundamental importance to the success of the project as it is these decisions that impact the cost of financing, the returns on investment and hence whether the sponsors can raise sufficient funds to develop the project. Project sponsors usually have several options from which to determine the optimal financing structure. When deciding the most appropriate option to select, the sponsors will usually consider several factors, the most importance of which include: the overall cost of funding, especially the cost of debt, the amount of debt and financial gearing, the composition of debt and equity, the terms of finance and extent of lender control rights and any requirements for sponsor support. Tax, accounting, local jurisdiction, market conditions and precedent transactions can also all influence the structuring decision.

The influence of each of the aforementioned considerations varies depending on the specific circumstances of the project. For smaller sponsors, for instance, the most important consideration may be to raise the maximum amount of debt possible. Costs of funds may be a secondary issue and the sponsors may be more willing to concede significant control rights to the lenders. On the other hand, larger and financially stronger sponsors may be more focused on achieving the lowest possible costs of funding. Given that most projects are developed in the context of a joint venture, it is readily apparent that differences of priority need to be carefully considered and managed to ensure that all the sponsors are in agreement with the proposed financing strategy.

Sources and Uses of Funds

The cash inflows and outflows during the project development period are normally presented in a 'sources and uses of funds'[3] statement. This statement concisely summarises the development period budget up to project completion and defines the financial structure of the transaction. The sources and uses of funds statement is usually extracted from the base case financial model and is often included in the term sheet as the basis for the committed debt finance structure. By way of illustration, an example of sources and uses of funds statement based on an illustrative US$ 10 billion project is presented in Table 2.1.

TABLE 2.1 Sources and Uses of Funds for a Hypothetical US$ 10 Billion Project

Uses of funds			Sources of funds		
EPC* costs	7,500	75.0%	Senior debt	7,000	70.0%
Owners' costs	750	7.5%	Project revenues	500	5.0%
Finance costs	1,500	15.0%	Equity/ subordinated debt	2,500	25.0%
Reserve accounts	250	2.5%			
Total	**10,000**	**100.0%**	**Total**	**10,000**	**100.0%**

**EPC costs in this context refers to 'engineering, procurement and construction' contract costs (see Section 12.4.2).*

This sources and uses of funds statement clearly shows how project funds will be spent and from where the funds are sourced. In this case 75% of project costs relate to construction contracts and should be largely fixed. Finance costs relate to interest during construction and various fees payable by the project. In this case the project is financed using US$ 7 billion of debt, which is equivalent to 70% of project costs. The sources of funds also include project revenues earned during the construction period.

Uses of funds during the development period include expenditure on the physical assets of the project, working capital, owners' costs and transaction costs (legal fees, finance fees, etc.). The majority of the costs are spent on the physical assets to develop the project and these costs are typically incurred pursuant to an EPC contract. Owners' costs are incurred by the sponsors throughout the development period. Some of these costs will already be paid by the sponsors and hence an element of this amount represents re-imbursement for

3. Sources and uses of funds statements are used in other areas of finance including, for instance, mergers and acquisitions financing. The formats, terms used and presentation of these statements often vary depending on the use.

historical development costs.[4] Funding of all necessary cash reserve accounts is usually a condition to project completion. The cash required to fund these accounts is therefore also included in the sources and uses of funds statement.

A number of important issues need to be considered when reviewing sources and uses of funds statement. Firstly, the statement is usually presented in a single currency, which, for oil and gas projects, is almost invariably the US dollar. In practice, however, the underlying cash flows are typically denominated in different currencies. There is, therefore, often an element of currency translation in the sources and uses of funds that needs to be fully understood. Secondly, there are certain elements of the statement which can be presented in a variety of ways. Projects often generate net operating cashflows in the period prior to completion which are included as 'pre-completion revenues' in the sources of finance. The calculation and treatment of these cashflows in the underlying financial model should be carefully examined and the risks to this source of funding assessed. Finally, the funding of reserve accounts and working capital is often the subject of negotiation with the project lenders. Although it is usually assumed that reserve accounts can be fully or partially funded using debt drawdowns prior to project completion, this is not always acceptable to lenders.

Financial Structures for Equity and Debt

The sources and uses of funds statement provides a summary of the total cash inflows and outflows during the development period. Financial structuring is however concerned with the financing cashflows throughout the whole period of the project. Given the high level of debt in project finance transactions, the cashflows relating to debt finance usually influence the finance structure to the greatest extent. The most important issues to address when considering debt funding include:

- *Drawdowns*: The timing of drawdowns of debt and the priority of drawings between the different tranches of debt need to be considered.
- *Availability of drawings*: The period over which the debt will remain available for drawing during the project development period and the treatment of interest during this period.
- *First repayment*: The timing of the first repayment of loan principal and the interaction between this timing and the completion date of the project.
- *Debt repayment*: The profile of debt repayment during the operating period of the project and the timing and amount of the final repayment of the loans.

Although debt cashflows tend to dominate project financing, the project sponsors are equally interested in the structure of the equity cashflows. It is

4. Lenders to a project will want to ensure that any historical costs included in the sources and uses of funds statement are genuine and appropriate. If these costs are material and are being partially reimbursed by project loan proceeds then the lenders will normally expect the costs to be audited and verified by a third party.

these cashflows that will determine the sponsors' investment requirements and the returns from dividends. The issues to be considered for equity financing structures include:

- *Equity injection*: The timing and mechanisms for injecting equity into the project.
- *Form of funding*: The choice between share capital, subordinated debt and other forms of equity funding.
- *Investor returns*: The procedures and requirements for the payment of dividends and interest on subordinated debt.

The debt and equity cashflows cannot be structured in isolation. It is important, for instance, for project lenders to appreciate that debt terms strongly influence the returns to equity and that, unless the sponsors earn an adequate return, the project is unlikely to succeed.

Lender Control Rights and Covenants

Lender control rights are the mechanisms included in loan agreements that provide lenders with a level of control over the activities of a borrower. Without control rights, lenders would have no power to direct the management of the borrower and hence would face significant risks that the borrower's business is managed in a way that could jeopardise debt service.[5] The risks become especially high when borrowers experience financial difficulties and, as a result, many of these rights are designed to give lenders increasing levels of control in the event a borrower starts to approach difficulties. Control rights are especially important in project finance transactions given the usually high levels of debt which sponsors aim to raise and the fact that lenders are relying almost solely on the project cashflows to service the loans.

Lender control rights are usually invoked through various assurances or promises known as 'loan covenants'. There are three categories of covenant, namely: positive, negative and financial. Positive covenants are promises by the borrower to act in a particular way and normally include the borrower agreeing to develop a project according to the agreed development plan, to provide regular reports on project performance to the lenders and so on. Negative covenants are promises to refrain from acting in a particular way and include the borrower agreeing not to undertake an expansion project or not to incur any operating costs that are outside the agreed annual budget. Financial covenants are usually expressed as minimum ratios that the borrower needs to maintenance. Failure to

5. The term 'moral hazard' is used in economics to describe the situation whereby one party to a contract, knowing they are not at risk, takes actions which are detrimental to the other party. The lender–borrower relationship is an example of the risk of moral hazard. To minimise the likelihood of the borrower acting imprudently, the lender should carefully monitor and control the actions of the borrower.

achieve these minimum ratios can result in a prohibition on dividend payments, a default under the loan agreement and so on.

The loan covenants in a project financing are usually much more detailed and intrusive compared to a corporate financing. This reflects the fact that the lenders are taking direct risk on the performance of a specific project and need assurances that the project will be developed, operated and managed in accordance with the agreed plans. Covenants are often the subject of intense negotiation during the financial structuring process. In the oil and gas industry, it is often extremely difficult to manage the development of a complex project without flexibility in the original development plans. Reverting to lenders for approvals to change drilling programmes, make operational amendments to key project contracts or make necessary changes to the project design, can result in an overly cumbersome process.

In addition to the controls on the borrowers' business activities, lenders will also seek to control the borrower's bank accounts and cashflows to the greatest extent possible. A project finance loan agreement will therefore contain detailed provisions on the establishment and operation of bank accounts and the movement of funds between the various accounts. These provisions and mechanisms for dealing with project accounts are examined in further detail in Section 19.4.4.

Unconventional and Hybrid Financing Structures

There are circumstances where it may not be feasible to adopt a pure project finance structure based on a single purpose company and the development of a greenfield project. The issue of non-traditional corporate structures has been noted earlier and similar considerations apply to the financing structure for these types of project. It is often found that a project is being developed as part of an existing operation that already generates cashflows. In this case the financing structure will feature elements of both corporate and project financing and is termed a 'hybrid' structure. Hybrid structures also often occur in situations where project finance is being used to fund assets that have some form of residual value. In this case the financing structure often features elements of both project financing and asset financing.

In general, hybrid structures usually create additional structuring challenges. There are increased risks that existing operations and finances interfere with the new development project. It may also be more difficult for lenders to impose controls on the existing operations. The new project may rely to a significant extent on the operational and financial performance of existing assets of the borrower. In many cases the sponsors are reluctant to lose their rights to dividends from the existing operations during the development phase of the new project. Furthermore, the existing operations may already have outstanding debt obligations, which need to be structured into any new financing. Hybrid structures will be examined in more detail in the context of oil and gas projects in Section 14.5.

2.3 PROJECT FINANCE TOOLS AND TECHNIQUES

The previous section provided an introduction to the various project finance structures. The techniques used to develop these structures are examined in more detail in the following sections.

2.3.1 Approaches to Structuring Senior Debt

The structures and terms of project finance debt are derived from conventional corporate loans. Lenders commit to provide a loan that is repayable in instalments according to a contracted repayment schedule. For project finance transactions these loans usually extend for medium to long-term periods, sometimes up to 20 years and beyond. During the term of the loan, lenders are not able to demand early repayment unless the borrower defaults under the loan agreement. The occurrence of an event of default allows the lenders to exercise various remedies according to the terms of the loan agreement. Although the underlying structure of a project finance loan is conventional, there are a number of features that reflect the more complex nature of project cashflows.

Structuring Techniques for the Development Phase

During the development phase of a project, significant costs will be incurred relating to the various design, procurement, construction, commissioning and completion activities. Until some form of production begins, the project will not generate any income and hence the only source of funding during this period will be from external sources of debt and equity. The majority of projects costs will normally be incurred pursuant to contracts with development contractors, which typically include detailed schedules of milestone payments. Together with other forecast cost estimates, these payment schedules will form the basis of a development period budget.

There are two important characteristics of large development projects that influence the structure of project finance debt. Firstly, the project company will need to be able to drawdown funds for an extended period of time, usually up to the final payments made pursuant to the development contracts. Provision is made in project finance loan structures to allow the borrower to request drawings during an extended loan availability period. Secondly, since the project will not be generating revenues until completion it will not be feasible to make interest payments and principal repayments during the period prior to project completion. Provision is thus made in the loan structure for extended principal grace periods[6] and for the capitalisation of interest until the first repayment date.

Project lenders are clearly at significant risk during this period given that they are contractually committed to continue disbursing funds to the project

6. A grace period in a loan agreement is a period of time during which there is no obligation on the borrower to make principal repayments. Grace periods are discussed further in Section 17.4.1.

company whilst at the same time there is no interest being paid and no obligation to make any principal repayments. It is not surprising therefore that the lenders usually want to exert a significant level of control over the project company during this period. Lenders will want to control the drawdown of funds and ensure that the proceeds of the loan are only used for the purposes of funding project development costs. Loan drawings will usually be suspended if the borrower defaults. Lenders will also want to closely monitor the progress of the project and be made fully aware of budget overruns and schedule delays. The project company is also normally prohibited from making payments to the sponsors and shareholders during the development period of the project.

The completion of the project represents an important stage in the project financing. More will be said about the criteria for project completion in Section 12.3.3. In terms of the financing structure, however, project completion means that the final drawdowns are made under the loan and, as the project should now be generating revenues, the debt can start to be repaid and interest serviced on a regular basis.

Structuring Techniques for the Operational Phase

When the project achieves completion and moves into the operating phase it should start to generate net cash inflows and the focus moves away from funding project costs to debt servicing and dividend payments. There are two important considerations for debt structuring during the operational phase namely: the structuring of debt principal repayments and the control of cashflows by the lenders.

The repayment of principal under a term loan can be made in any number of ways depending on the terms agreed between the borrower and the lender. The simplest approach would be to structure the repayment profile on the basis of equal principal instalments for each period during the loan term. Another approach could be to allow the borrower to defer principal repayment until the final maturity date of the loan. This arrangement is commonly termed a ‘bullet’ repayment profile. In practice, however, neither of these arrangements is particularly common as they both result in a high degree of variation in debt service payments throughout the term of the loan. The starting position for project finance tends to be a repayment profile which results in level debt service during the loan period, a structure which is identical to a standard mortgage type repayment schedule and is commonly termed an ‘annuity style’ repayment schedule. A variety of techniques are then typically employed to ‘sculpt’ the annuity repayment profile. Debt sculpting has already been referred to earlier (Section 1.5.3) and uses a variety of techniques to modify the basic annuity repayment profile. Repayments of principal may be increased or decreased in specific periods to match the cashflow characteristics of the project. Cashsweeps are often employed to accelerate the loan repayment if the project generates excess cashflows. Target and mandatory repayment profiles are often incorporated to manage cashflow variability. Finally the loan may not fully repay during the term of the debt leaving an amount (known as a balloon) outstanding on final maturity.

In addition to sculpting of repayment profiles, there are a variety of other techniques that are commonly employed to give the project flexibility in its funding arrangements. The financing structure usually includes prepayment provisions allowing the borrower to make early repayments without penalties. Borrowers are also typically allowed to defer a proportion of principal repayment.

The second area to consider is the control over the project cashflows. Lenders take great care to ensure that there is minimal risk of uncontrolled cash outflows which could impact the ability of the borrower to service its debt obligations. There are various ways that cash can 'leak' out of the borrower. Operating costs need to be carefully controlled, for instance, and lenders will want to ensure that all project costs are legitimate. In addition, the lenders will want assurance that payments to shareholders and sponsors are reasonable and are not inflated by the inclusion of excessive profit margins over-and-above the cost of providing the goods or services. The two major areas of control which lenders will want to structure into the project financing are: budget control which will allow the lenders to control the ability of the borrower to spend money and bank account control which allows lenders to control where cash will be placed and how much cash needs to be retained in the business.

2.3.2 Approaches to Structuring Equity and Sponsor Funding

Equity represents the difference between the total project development costs and the amount of senior debt raised. If for any reason there is a shortfall in equity then the project will be under-funded and, without an alternative source of funds, will fail to achieve completion. Clearly the funding of equity is a vital consideration for project success. There are numerous approaches to funding equity the most common of which are share capital and subordinated sponsor debt. In addition, equity can be used to finance project costs at different times. The quantum of equity funding, the types of funding and timing will all impact the returns which the sponsors will ultimately earn from the project. As a result, it is essential to ensure that equity is structured in a satisfactory manner.

Share Capital

The simplest and most common method of equity funding is for a company to issue ordinary shares. The holder of an ordinary share is known as a 'shareholder' and the total funding raised by issuing shares is known as 'share capital'. Shares represent a unit of ownership in an incorporated company usually carry voting and dividend rights. Some jurisdictions may allow companies to issue different categories of ordinary share each having different characteristics and rights. Companies may also issue preference shares. These shares benefit from rights in priority to the ordinary shareholders most commonly in terms of the payment of dividends and the rights to assets in the event of company liquidation. Preference shares can have beneficial tax treatment. The consideration for the issuance of shares does not have to be in the form of cash. Often joint venture partners may want to provide non-cash consideration such as physical assets or technology rights, etc. This raises certain challenges, especially the issue of valuation of the non-cash consideration. Not only the joint venture partners but also the project finance lenders will want to ensure that the shares are being issued for a reasonable value.

Sponsor and Shareholder Loans

Project sponsors typically view share capital as a relatively inflexible method of funding and hence seek to minimise funding by way of share issuance. Subordinated loans are often used to fund project equity as these loans provide sponsors with more funding flexibility. Subordinated loans allow the sponsors to fund their equity commitments through a loan agreement with the project company. These loans are subordinated to the senior lenders and, rather than the sponsors earning their returns from dividends, the project company pays interest and repays principal out of project cashflows, which would otherwise have been used to pay dividends. As well as being more flexible, sponsor loans also usually have tax advantages given that the loan interest is deductible from taxable income.

Timing of Sponsor Funding

In general, project sponsors prefer to defer sponsor funding as late as possible and drawdown the debt to fund project costs first. In this situation the lenders are at risk that the sponsors are unable to satisfy their funding obligations, especially when the timing of equity is late in the development phase. There are a number of techniques that are commonly used to assist in bridging the gap between lenders and sponsors.

Firstly lenders usually insist on the sponsors providing direct contractual obligations to fund their share of the project costs. These agreements are normally called equity subscription agreements[7] and include provisions for the timing and amount of equity contributions. Lenders will usually try to negotiate provisions whereby they can accelerate the funding of equity in certain specific circumstances including, for example, instances whereby the borrower defaults under the loan agreement. The lenders would ideally expect these types of agreement to be entered into by the sponsors directly with the lenders themselves and for lenders to be able to control the provisions of the agreement directly. The sponsors could also provide their obligations to the borrower. This is, however, a weaker position for the lenders.

Secondly, there are a variety of arrangements that involve the sponsors or project company taking out loans for the equity funding obligations. The project company may, for instance, borrow funds pursuant to an equity bridge loan whereby commercial banks make loans to the project company that are guaranteed by the sponsors. The project lenders (rather than the equity bridge lenders)

7. Equity subscription agreements are important project finance documents and are discussed further in Section 19.4.6.

normally take a cautious approach to this method of funding as it results in the borrower taking on more debt, albeit with an element guaranteed by the sponsors. The timing for the repayment of the equity bridge loans will need to be agreed upon with the lenders. This would logically take place at project completion although there has been an increasing trend towards deferring these loans further into the project operational phase. The equity bridge loans will also need to be fully subordinated to the other lenders.

Sponsor Returns

The sponsors of a project are ultimately concerned with the returns that they will make on the funds that they invest. A vital element of the project financing process is the sponsors' final investment decision and the financial returns which the sponsors earn from the project will form an important part of the decision making process. The common methods of investment return measurement use the concept of discounting[8] to account for the time value of money. By discounting at an appropriate rate, the cashflows of different projects can be compared at a common point in time.

- *Net present value* (*NPV*): The NPV calculation has already been introduced in the context of lender cover ratios (Section 1.5.1). Different considerations apply, however, when using NPVs for the purposes of sponsor investment appraisal. The choice of discount rate will have a significant impact on the NPV calculation. The higher the discount rate, the lower the NPV. There are a number of different methods that can be used to determine an appropriate discount rate. It is, however, beyond the scope of this text to examine the merits of these methods in detail. In general, for investment appraisal purposes companies use the corporate weighted average cost of capital[9] or a risk-adjusted rate specifically determined for a particular investment opportunity.
- *Internal rate of return* (*IRR*): The IRR is the discount rate, which results in a net present value of zero and is presented as a percentage return on investment. In essence the IRR is the rate of interest or growth rate earned by the project cashflows given the amount invested. The higher the IRR, the more attractive the investment opportunity.

Both the NPV and IRR are used to determine whether investments are acceptable. They allow investment opportunities to be compared against standard criteria, namely the minimum required investment return on the funds invested in the project. There are a number of well-documented arguments concerned with the suitability of NPV and IRR calculations for investment appraisal purposes.

8. Discounting involves the reduction of monetary values of cashflows at a particular future point in time to reflect the fact that money in the future is less valuable than money in the present.
9. The weighted average cost of capital or "WACC" is the average cost of the various sources of a firm's capital.

Although it is not the intention of this text is to provide any detailed theoretical analysis of these investment appraisal methods, it should be noted that in general the NPV method of appraisal is considered to be superior to the IRR method.

2.4 SECURITY STRUCTURES, SPONSOR SUPPORT AND OTHER FEATURES

Lenders expect to take security interests for their loans so that, in the event a borrower defaults, they are able to take possession of the secured assets, realise any value (by selling an asset, for instance) and use the proceeds to repay the loan. Even though project finance lenders are chiefly concerned with project cashflows for debt servicing, the ability to take security over project assets is an essential consideration for lenders. In addition, while lenders rely primarily on the performance of the project to repay their loans, it is common for the project sponsors to provide some form of contingent support, particularly where certain risks are difficult to mitigate otherwise. The following sections consider security and sponsor support together with certain other common features of project finance.

2.4.1 Project Finance Security

Lenders rely on the project assets to generate the revenues from which the loans are repaid. Given that the assets of a project range from tangible physical assets such as plant and equipment through to intangible interests in project contracts and technology licences, the security arrangements for project finance can become very complex. A further consideration is the fact that the project assets can be located in various jurisdictions and local security laws can have a significant influence on the lenders' ability to take security and enforce their rights.

Security taking for project finance is, however, slightly different compared to the more traditional forms of secured lending. Lenders usually take security over an asset so that in the event that the borrower defaults under the loan the lenders can take hold of the secured asset and, if necessary, realise the value of the asset. It is often the case, however, that the assets of a project are of little value unless they are generating cashflows. If they are generating cashflows then there is no reason to enforce the security. The motivation lenders have for taking security interests in the project assets is largely defensive as opposed to an expectation that significant value will be realised. The types of security which lenders will usually take for project finance include: the physical assets of the project, the project company bank accounts, the rights under the project contracts, project insurances and performance bonds, guarantees etc. provided by contract counterparties.

Making sure that an effective security interest is created over the assets of the project company can be a challenging exercise. The steps required to perfect a security interest in a particular asset are usually dictated in the local laws and regulations where the asset is located and much time and cost can be spent on security perfection in jurisdictions with limited project finance track-record. The specific issues with security perfection will be discussed in greater detail in Section 19.4.5.

2.4.2 Sponsor Support Arrangements

We have seen in the previous section that security provides a secondary and contingent source of loan repayment for project finance lenders. In addition to security, however, lenders often seek other forms of secondary protection in the event that the project cashflows are insufficient to service the debt. In certain circumstances lenders may require the project sponsors to provide support, the exact nature of which is typically the product of a lengthy negotiation process between the sponsors and the lenders. Common forms of sponsor support include: guarantees to the project company or directly to the lenders, debt service undertakings to the lenders, contingent funding commitments and support provided through favourable terms in project contract between the project company and sponsors. The risks associated with project completion are particularly difficult for lenders to accept and it is often the case, therefore, that the lenders ask for sponsor support during this period. The nature of sponsor completion support will be discussed further in Section 17.7.1. The acceptability of any form of support arrangement will, however, be dependent on the credit worthiness of the entity providing the support. Financially strong sponsors will obviously be able to provide better support and risk mitigation compared to weaker sponsors.

2.4.3 Other Features of Project Finance Structures

There are a variety of other features of project finance that come about because of the importance of project contracts as security for lenders and the need to manage various specific risks inherent in project cashflows.

Direct Agreements

A direct agreement is an agreement between the lenders and the counterparties to the project contracts. As we have seen earlier the project company will enter into a wide range of project contracts and it is these contracts that determine the project cashflows and the risks to which the lenders are ultimately exposed. Due to the fundamental importance of the main project contracts to the lenders and, in order to establish a direct relationship between the lenders and the project, counterparties enter into direct agreements in relation to each of the project contracts. An important aim of a direct agreement is to suspend the termination of the project contracts and allow the lenders to rectify any defaults under the agreements. Lenders are usually given rights to substitute the project company with an acceptable substitute entity. These substitution rights are termed ‘step-in’ rights and are designed to enable the lenders to preserve the project contract structure in the event that the project company defaults under its agreements. A typical direct agreement is likely to include the following provisions:

- *Suspension*: The lenders are given notice of any potential termination and the contract counterparty agrees to suspend termination for an agreed period of time.
- *Step-in rights*: The lenders are given the right to take over the rights of the project company pursuant to the contract. In practice the lenders will also include the right to appoint a nominee to manage any step-in.
- *Novation*: The lenders are given the right to novate the contract to a nominated substitute. A contract counterparty will obviously have an interest in the identity and capabilities of any substitute and will usually either want to ensure there are agreed upfront criteria or the novation is subject to approval.
- *Notice of assignment*: The project contracts form an important element of the lender security package and the direct agreements will include a notice to the contract counterparty that the underlying contract is assigned by way of security to the lenders. By signing the agreement the contract counterparty acknowledges the lenders' security interests in the project contract.
- *Other*: The direct agreement is likely to include other provisions such as various representations and warranties from the contract counterparty.

Direct agreements also contain a number of other important provisions which are aimed at ensuring the project contracts form 'bankable' agreements. Direct agreements are often used to direct the payments under the contract. A major offtaker, for instance, may agree pursuant to a direct agreement to make payments to an offshore bank account secured in favour of the lenders.

The negotiation of direct agreements can be difficult and time consuming. The contracting parties are often reluctant to enter into direct agreements, as they cannot immediately see the benefits of agreeing additional terms with unrelated lenders. To ensure that the contracting parties are incentivised to enter into these agreements it is normally advisable to include proforma direct agreement terms as an appendix to preliminary draft contracts and ensure that contract counterparties agree to the terms as part of any bidding process.

Financial Derivatives and Hedging Contracts

A derivative contract is an agreement between two parties to make payments to each other based on the difference between the market price of an underlying asset or index and an agreed fixed price. An interest rate derivative contract, for instance, will involve the parties to the contract paying the difference between a quoted interest rate (usually LIBOR) and an agreed fixed interest rate stipulated in the contract. In this way one party is able to manage its interest rate exposure by fixing the rate in the derivative contract. Derivative contracts are often used in project finance transaction to manage and mitigate specific risks. The sensitivity of the project cashflows to interest rate movements may mean that the project company is required to enter into interest rate derivatives to wholly or partially fix its interest costs. These derivative contracts can take a variety of forms including swap contracts, options, forward agreements and future. In a similar way, derivatives contracts can also be used to manage currency and commodity risks.

Derivative contracts can, however, add significantly to the complexity of project finance structures and the financing arrangements need to accommodate the terms of any derivative contracts and the rights of the derivative contract counterparties. If not managed properly the project company may find that it is liable to significant sums pursuant to derivative contracts. In the worst case movements in the underlying benchmark prices can jeopardise the financial viability of the project. In addition, if a project experiences general cashflow difficulties, financial exposures pursuant to derivative contracts need to be carefully managed to ensure that the derivative contract counterparties will not prejudice negotiations between the borrower and project finance lenders. These structural issues will be examined in further detail in Section 18.5.

Chapter 3

Sources of Finance and the Global Project Finance Markets

Chapter Outline

3.1 INTRODUCTION

The purpose of this chapter is to consider where the funds for project finance actually come from and to examine the characteristics of the different sources of finance for projects. There are a variety of different institutions involved in the project finance markets. Although many of these institutions operate in the private sector, there are a number of important public sector entities actively involved in project finance. The following sections will look at these different sources of funding and examine how they are brought into project finance through the international financial markets.

Section 3.2 begins by considering the sources of equity finance for projects. Although projects are normally highly geared and debt is typically the dominant funding source, equity performs a vital role in project finance. Lenders expect to see a significant equity contribution from the project sponsors both to demonstrate sponsor commitment to the project and to act as a financial buffer in the event that cashflows are lower than forecast. While project sponsors provide the majority of equity funding, there are other sources including the public equity markets and institutional investors.

Section 3.3 looks in more detail at the sources of debt for project finance. International commercial banks have traditionally been the most important providers of project finance through the international syndicated loan markets. Other important types of finance for project finance include Export Credit Agencies (ECAs), the bond markets and other more specialist sources such as Islamic finance.

Section 3.4 then goes on to consider the international project finance markets. The characteristics of this global market are described and the way the market works in practice is explained.

3.2 SOURCES OF EQUITY

Project finance requires long-term equity funding from entities that are prepared to take the risks of the project during the development phase and remain committed preferably for the entire project life. As a result, the vast majority of equity for project finance transactions is sourced from the project sponsors as it is they who promote the project and are responsible for managing project risks. In addition to the project sponsors, there are other potential sources of equity funding for project finance and, whilst not as common as the project sponsors, these other providers have performed important roles in certain transactions. Funding may be sourced, for instance, from public stock markets or from equity funds and institutions. Multilateral organisations can also in certain circumstance provide equity funds.

Given the importance of equity funding for project success, lenders will be concerned that the arrangements for equity are acceptable. Lenders will want to ensure that the level of equity committed to the project is sufficient and will assess the risk that equity funding may not be available. The obligations of the project sponsors to finance their equity commitments are often significant and unless properly managed individual sponsors may run into difficulty raising equity funds when required.

3.2.1 Project Sponsors

The project sponsors typically fund their equity either by subscribing for project company share capital or making subordinated loans to the project company. Whichever funding method is used there are a number of important considerations that need to be addressed. The nature of the sponsors' commitment to fund equity should be carefully defined in the various financing agreements. These commitments are usually made to the project company, the other joint venture sponsors and the project lenders and, unless the sponsors fund their equity in advance, the project will be exposed to the financial risks of the sponsors' credit risks. If the sponsors are funding their equity commitments using subordinated loans then the lenders will be particularly concerned to ensure that the terms of these loans do not impact the senior loans. The terms of subordination will be particularly important in this regard.

Nature of Funding Commitments and Joint Venture Arrangements

Joint ventures are common in the oil and gas project finance and the nature of the various sponsors' equity funding commitments is usually governed by the terms of the joint venture arrangements. Given that joint ventures usually include a diverse mix of entities, a significant challenge for project finance transactions involves the management of the ability of different project sponsors to fund their share of equity. The joint venture partners typically agree upon their funding obligations according to a joint venture or shareholders agreement (or in the case of an unincorporated joint venture a joint operating agreement). Joint venture and shareholders agreements include a variety of terms which govern the management of the project, funding provisions and so on. These agreements thus have a significant impact on the way the joint venture is financed and managed. As a result, project finance lenders have an interest in the terms of these agreements, especially where these may conflict with the financing arrangements. The following are some of the more important terms of joint venture agreements which lenders will typically examine:

- The management structure of the joint venture company and methods of decision making (including voting rights and so on).
- The roles and participations of each of the partners to the joint venture.
- Funding mechanisms (including shareholder loans and third party debt) for the joint venture and method of capitalisation.
- Transfers of interests and the rights of partners to pre-empt any transfers.
- Accounting and tax, including dividend policies.
- Resolution of disputes and governing laws.

The exact nature of these agreements can vary significantly depending on the particular circumstances of the project. In many oil and gas projects, for instance, the involvement of the host government as a shareholder or joint venture partner can complicate the joint venture arrangements. As part of the licensing or concession conditions, host governments often impose carried interest obligations on the other joint venture partners. The non-carried joint ventures partners fund the government's share and charge some form of fee or interest on the amount funded. Those partners carrying the state's interest would then have the right to the state's share of dividends until the carried interest has been fully repaid. The exact mechanisms for carrying a partner can become highly complex and are typically the subject of extensive negotiation.

In addition to the funding provisions within the joint venture agreement, the sponsors will also usually need to provide funding commitments to the project lenders. Again, the exact nature of these commitments will depend on the specific circumstances. If, for instance, all equity is funded upfront then the lenders will be less concerned about the funding risks. Even in this scenario, lenders may still require sponsor commitments to fund cost overruns. In practice, project finance lenders typically expect the sponsors to enter into an equity subscription agreement with both the project company and the lenders pursuant to which the sponsors agree to fund their equity obligations as required by the project company.

Sponsor Credit Risks

The ability of the different joint venture partners to fund their equity is usually quite varied. For large oil and gas projects, the financial commitments can be significant and represent a sizeable capital budgeting challenge for many enterprises. Assuming a US$ 10 billion refinery project is being developed on the basis of a 70:30 debt:equity ratio and that the lenders have agreed to equity being funded at the same time (pro rata) as debt over a 4 year development period. The lenders will then be exposed to the risk that the sponsors may be unable to fund US$ 3 billion over the next 4 years and that a shortfall in funding occurs. To eliminate the risk of funding shortfalls, project lenders will typically prefer equity to be funded in advance. In contrast, the sponsors will usually want to defer equity funding for as long as possible. Although lenders will usually accept some form of deferred equity funding, provision is usually made in the equity subscription agreement for the sponsors to provide bank guarantees or letters of credit to secure the sponsors' payment obligations. Lenders also normally expect the sponsors to fund any outstanding equity obligations prematurely in certain circumstances such as acceleration of the loan or abandonment of the project.

Sponsor Loan Subordination

The equity subscription agreement also usually makes provision for the sponsors to fund their equity with subordinated loans rather than share capital. Sponsors often prefer to provide subordinated loans as the interest on these loans is usually tax deductible (in contrast to dividends which are not), the loans can be secured (recognising that the senior lenders have a priority claim) and the amounts funded can more easily be repaid to the sponsors (share capital, for instance, can only be repaid if there are sufficient capital reserves to do so). Although lenders rarely object to funding using subordinated debt, in practice subordination can be hard to achieve and can create additional complications. The sponsors will become creditors under the subordination agreement and hence provisions will be required to ensure that the senior lenders are in no worse position.

The senior lenders will want to ensure that any loan interest and principal payments made to the project sponsors are only paid out of funds which would otherwise have been available for dividends. In practice, if a project is generating sufficient cashflows then there should be no difficulties in the prioritisation of these payments. The difficulty occurs when cashflow is insufficient. The senior lenders will want to ensure that sponsors are restricted in their ability to enforce their loans against the project company, realise any security, and threaten bankruptcy proceedings. In many jurisdictions, however, achieving effective subordination can be difficult and loan subordination agreements will need to be carefully drafted in accordance with the relevant legal regimes.

3.2.2 Public Markets and Stock Exchange Listing

Although majority of the project finance transactions have traditionally involved private ownership by the project sponsors, there are examples of project companies having been wholly or partially listed on public exchanges.[1] Capital is initially raised on a stock exchange by listing shares in the company through an initial public offering (IPO). Further funds can be raised through subsequent offerings known as Seasoned Offerings or Rights Issues.[2] In contrast to a private company, the shares of a public company can be openly traded and the share price is publicly disclosed.

Although listing on a public stock exchange allows sponsors access to a deep and highly liquid source of equity capital, public listing is rarely encountered in project finance. Sponsors wishing to raise capital on a public exchange must comply with the relevant listing rules. These rules are designed to protect public investors and hence typically require sponsors to openly disclose a significant amount of information. The work and commitment involved in complying with these rules mean that a public listing is an onerous undertaking. In addition, there are certain structural issues which make public equity issuance challenging for project finance. It is difficult, for instance, to phase the funding of equity during the construction period. Proceeds from a public equity offering are normally made at the time of the allotment of the shares and hence funding occurs at a single point in time. The exact timing can, in addition, be difficult to predict given that market conditions can influence the ability to raise share capital. Furthermore, it is not possible to apply cost overrun commitments and support arrangements when public shareholders form part of the shareholding group. A further timing issue concerns the payment of dividends. During the construction period the project company will not be generating funds and hence will not be able to pay dividends. For large projects this period could extend to several years, especially if the project is delayed. The lack of dividends for an extended period of time could be unattractive to certain potential investors and hence restrict the availability of funds.

A public listing of the shares of the project company also means that a more diversified group of investors will have to be managed. The listing requirements involve significant additional obligations both at the time of the offering and subsequently once the shares are listed. The company will be required, for instance, to provide ongoing information much of which will be publicly disclosed. Given the complexity of the underlying financial structures of a project financing and the close relationship between the various parties involved in the transaction, public disclosure of information can

1. The Eurotunnel project is a well-known publicly listed project finance transaction. The £9 billion project was financed almost entirely from private funding sources including public listings of Eurotunnel shares in 1987.

2. Seasoned offerings and rights issues are dealt with further in Section 14.3.3.

cause additional complexity, especially if the project experiences financial difficulties.

There are circumstances, however, where public listing has been used extensively. This has normally been in response to a government requirement to support the development of a domestic stock exchange and the IPO requirements usually come in as a refinancing of existing sponsor equity once the debt financing has been put in place. Most recently the development of the downstream industry in Saudi Arabia has relied on a significant element of project financing together with a requirement to list a minority share of the project equity.

3.2.3 Other Sources of Equity Funding

In addition to the project sponsors there may be other private investors with an interest in the project. Unlike the project sponsors (who usually have a wider strategic interest in the project) non-strategic investors are typically attracted to the venture for purely financial reasons. Their interest will be in earning an attractive return on their investment given the risks, which they are expected to take. Institutional investors, including pension funds, insurance companies and investment funds, have played an important role in certain types of project finance. Although more common in infrastructure projects these institutional investors can be a potentially attractive source of equity funding for non-infrastructure type projects. The majority of institutional investors follow strict investment strategies, the aims of which are to target minimum levels of returns on the funds under management and control the risks which the institutions are willing to take. Institutional investors also have different objectives in terms of investment time horizon. Pension funds with long-term liabilities, for instance, typically seek to invest in long-term investments.

Institutional investors are a much less important source of finance for project finance in the petroleum industry. The risk profile of projects in this industry is often too high for these more conservative intuitions, especially when considering completion risks, country risks and commodity price risk. In addition, the extended pre-completion periods, during which there are no dividends and potentially a requirement to fund cost overruns, are not attractive for financial investors. In certain sectors, such as mid-stream oil and gas infrastructure financing in developed economies, equity investment by large institutional investors is commonly encountered.

3.3 SOURCES OF PROJECT FINANCE DEBT

Although there are several important sources of project finance debt, commercial banks have traditionally been the most prominent lenders to projects. Commercial banks usually form syndicates to make loans to projects and debt is thus raised through the international syndicated loans market. ECAs have also been an important source of project finance debt, particularly for oil and gas projects.

ECAs are governmental organisations, which support exporters through a variety of financing schemes and are typically involved in project finance through credit insurance or guarantee structures. Although the bond markets represent a potentially significant source of funding for project, the contribution of bonds to oil and gas project finance has been relatively limited. The reasons for this will be explored further in the following sections. Other more specialist sources of finance including Islamic finance and lease finance have also played an important role in a number of transactions.

3.3.1 Commercial Banks

Commercial banks are in the business of providing traditional banking services including deposit taking, lending and payment services. Commercial banks have also played a dominant role in structuring project finance transactions. The structures and techniques, that have been developed over the years in the project finance market owe much to the work done by commercial bankers. Given the importance of commercial banks and syndicated lending in the project finance market, Chapter 4 will describe the functions and workings of these institutions and markets in greater detail.

3.3.2 Export Credit Agencies

ECAs represent their governments in support of a nation's exporters. These institutions typically provide state-backed funding and financial support to importers of eligible goods and services. ECAs have played an important, and in some cases essential, role in oil and gas project finance. Each government is represented by its own ECA and each ECA has different requirements, procedures and methods of providing financial support.[3] Although these various agencies provide similar export support schemes there are some important differences that can impact the terms of project financing. Some ECAs act in essence as government departments whereas others are part of a separate private institution. ECA financing is hence a complex subject and sourcing project finance from ECAs can present challenges. The purpose of the following sections is to provide an introduction to ECA backed finance rather than a detailed narrative on the policies, procedures and products of individual institutions.[4]

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3. UK Export Finance (formerly the Export Credit Guarantee Department) was one of the first export credit agencies to be formed (in 1919). During the 1920s and 1930s several European export credit agencies and US Exim were established. In addition to the United States and Europe, there are now a large number of active Export Credit Agencies in project finance including those supported by the governments of Japan, Korea, China, Australia, South Africa, Canada, Russia and Turkey.

4. Further information concerning the various specific export support schemes is available directly from the relevant national ECA. In addition, reference can be made to texts which cover export credit schemes for project finance including: Yescombe (2014) and Maizel and Borisoff (2011).

Role of Export Credit Agencies and Relevance to Project Finance

The traditional role of ECAs is to provide credit support for exporters in the event that a foreign buyer fails to pay for delivered goods. This support has typically been made available through a 'buyer's credit' arrangement which works as follows. Suppose a buyer (importer) in country A is looking to buy equipment from a supplier (exporter) in country B. Country A has a high level of credit risk and the exporter wants to cover any payment risks. The exporter therefore applies to the country B's ECA. Under a buyer's credit scheme the importer takes out a loan with a bank for the eligible proportion of the invoiced amount and pays the exporter. The ECA indemnifies the bank in the event that the importer defaults on the loan. Given that the loan is ultimately guaranteed by the government of country B, the bank is able to provide funding to borrowers that would otherwise not be available due to country risks.

The buyer's credit scheme originated in the support of short-term trade financing for the export of goods and services. Given the capital intensive nature of project finance and the fact that projects in developing countries typically need to import goods, equipment and services from abroad, the concept of an export credit supported buyer's credit structure has been successfully applied to project finance. In fact export credit backed finance has been one of the most important sources of funding for projects in emerging markets. ECA finance for projects does, however, need some adaptation for project finance. The tenors for project finance buyer's credits are usually much longer than those covering trade finance. The delivery of goods pursuant to a typical trade contract is not the same as the completion of a project and the ECAs will be expected to take completion risk until the project is completed. Most projects source goods from several countries and hence project finance normally involves several ECAs working together. ECAs will undertake a detailed and exhaustive appraisal of the project risks and are especially sensitive to environmental impact. Furthermore, given that they are public bodies, ECAs are typically subject to onerous disclosure rules.

The exact form of support varies between the different ECAs. Some ECAs provide guarantees whereas others provide insurance cover. The level of ECA cover is also variable. Some agencies will provide cover for 100% of the eligible amount whilst other will expect the banks funding the buyer's credit to take some residual exposure. The level of residual exposure varies but is typically 5% or 10%. Furthermore, some ECAs provide direct loans to buyers in addition to covering loans from banks.

The buyer's credit scheme is one of a number of methods of supporting exports. Financing schemes which support exports are known as 'tied' schemes and are subject to certain constraints (see below). ECAs also offer a variety of 'untied' schemes, which are not directly associated with exports and hence can be provided with more flexible terms. These untied schemes may involve ECAs making direct loans to projects or providing various levels of cover to commercial banks.

Terms of Export Credit Facilities

In theory, governments should be free to provide whatever support they see fit in order to promote their domestic exports. Exports increase domestic production, help create jobs and are generally beneficial to national economies, hence most governments have a strong interest in supporting their national exporters. The provision of state support to exporters has the potential, however, to seriously distort international trade and ultimately result in market failures such as higher than necessary import prices, losses to tax payers and so on. The risks associated with government supported trade are well recognised and a number of governments have thus agreed to a set of rules with the aim of ensuring that support for exports is provided in an orderly manner. These rules were originally established in 1978 and are known as the 'Arrangement on Guidelines for Officially Supported Export Credits' or the 'Consensus Rules'.

The terms which the various ECAs offer to project finance borrowers are very similar and reflect the Consensus Rules. It should be noted, however, that given the particular characteristics of project finance, the Consensus Rules have been modified in certain areas to allow ECAs more flexibility in structuring project finance credits. The more important terms are summarised as follows:

- *Cash payment*: ECAs will usually only fund up to 85% of eligible content of an export contract, the remaining 15% is funded by the importer.
- *Repayment term*: The consensus rules stipulate various rules regarding the repayment terms of the covered loans. For project finance transactions, special rules apply which, in summary, allow covered loans to be made for tenors up to 7.5 years average life.
- *Eligible content*: The eligible content determines the amount of cover, that an ECA is able to provide. In general the content of an export contract should relate to the export of goods and services from the government, that is providing the cover. An element of local or third country content is also usually allowable.
- *Interest rate*: Commercial Interest Reference Rate or 'CIRR' rate is a fixed rate of interest, which ECAs are able to provide borrowers. It is more common, however, for ECA covered loans to now be provided on a variable rate basis.
- *Premia*: ECAs charge insurance or guarantee premia for their cover. These premia are determined on a case-by-case basis although they are also subject to consensus rules regarding the exact method of calculation.

It is important to understand the concept of 'eligibility' in the context of ECA financing. ECAs will only provide cover for the eligible content of an export contract. A variety of eligibility criteria are used to determine whether content is eligible for cover. These criteria are broadly aimed at ensuring that the ECA is in fact covering goods and services which originate from their home country. Given the fact that many large construction and engineering contracts involve sourcing from multiple different countries, however, the determination of eligible content can be challenging. A contract to develop an LNG plant may, for example, involve a consortium of contractors from different countries and much of the equipment actually sourced for project may come from other countries. In addition there could be a substantial element of local content within the contract. As a result, ECAs have developed complex rules that are designed to recognise the fact that the promotion of a country's exports may in fact be dependent on support to other countries' exporters. In many cases an ECA will allow a proportion of local content to be covered by their policies. To add further complexity to the rules governing eligible content, many ECAs now cooperate closely with each other and will often jointly cover content or reinsure content with each other.

Working With Export Credit Agencies

ECA finance is often seen as onerous, bureaucratic and time consuming. While it is true that ECAs represent national governments (some being, or having been, government departments) and normally need some form of governmental approval to support projects, it is also true that all project finance lenders need to carry out extensive due diligence and obtain internal lending approvals. In contrast to commercial banks, however, ECAs are less concerned with wider sponsor relationships and can as a result be less willing to concede on particular issues. ECAs are also likely to be exposed to much more public scrutiny compared to other lenders, especially given that ultimately tax payers cover any payments made by ECAs. ECAs are in addition particularly sensitive to certain specific risk areas, especially environmental impact and management.

ECAs will usually start to engage with project sponsors following an initial approach by an exporter. It is often the case that during the contract tendering process the project sponsors will request contractors to include letters of interest or support from the relevant export credit agency. ECAs will normally then expect to receive a formal application with all relevant project information (information memorandum, financial model and so on) following which a detailed due diligence process will be undertaken. At this point ECAs invariably work closely with a variety of external consultants to advise them on project risks. Many ECAs will also expect to engage their own financial advisor to assist them in the analysis of the project. Once all the necessary internal approvals have been obtained the relevant ECAs will then issue letters of commitment following which documentation will be negotiated and ultimately the guarantees or policies issued.

The majority of large projects require finance from several ECAs and hence project sponsors often need to manage applications, negotiations and communications with different ECAs each having their own processes and requirements. A variety of cooperation agreements have been entered into between various ECAs, which allows for the coordination of activities in various areas between specific ECAs. Furthermore, the ECAs are invariably working alongside commercial banks and other potential lenders. The management of this process can be demanding and requires careful planning and a thorough understanding of the ECA requirements prior to starting to engage.

3.3.3 Multilateral Agencies and Development Finance Institutions

Multilateral Agencies (MLAs) and Development Finance Institutions (DFIs) are government owned institutions that aim to promote development. They operate and are active mainly in emerging markets. Unlike ECAs, MLAs and DFIs are owned by several governments and typically work on a regional or global basis. The exact scope of activities of the various MLAs and DFIs is determined by the governing articles of incorporation. Most of the multilateral agency financing structures involve co-lending with commercial banks although a number of multilaterals are also able to provide equity finance for projects. In addition, many of these institutions are able to provide advisory and assistance services to governments such as the development of economic, legal and regulatory frameworks and the implementation of specific projects.

MLAs have performed important roles in a number of project finance transactions in emerging markets, the most significant agencies being those belonging to the World Bank group, the European Investment Bank (the EIB), the European Bank for Reconstruction and Development (the EBRD), the African Development Bank (the AfDB) and the Asian Development Bank (the ADB). A variety of considerations need to be addressed when dealing with these institutions including: environmental and social requirements, co-lending, preferred creditor status and other intercreditor requirements.

Environmental and Social Requirements

MLAs are public organisations and are hence subject to a significant degree of external scrutiny. As a result, the various MLAs are particularly sensitive to environmental and social impacts of the projects which they support. Projects eligible for multilateral support will usually have to follow strict and onerous environmental guidelines and procedures. The World Bank and particularly the IFC have taken a leading role in the development of project finance environmental and social guidelines. Commercial banks have adopted many of the IFC guidelines and incorporated these in the Equator Principles (see Section 15.4.5), their own voluntary environmental and social code of practice.

Co-lending

A major objective of MLAs is to stimulate private sector involvement in development finance. Several of the multilaterals therefore offer co-lending schemes whereby the relevant agency provides direct funding alongside tranches of private sector (usually commercial bank) finance. The IFC, for instance, will provide a direct 'A' loan to a private sector borrower and commercial banks will then lend alongside the IFC in a parallel tranche known as a 'B' loan. The B loan commercial bank lenders do not benefit from any direct risk mitigation or guarantees from the IFC and the B loans do not provide any direct country risk mitigation. There are, however, a number of advantages to commercial banks in lending alongside the multilaterals. Lending alongside a multilateral should provide some form of political risk mitigation given that the multilaterals probably have more influence over projects, especially if the project is nationally important. In addition, multilaterals usually benefit from special treatment in certain defined areas including access to foreign currency and exemption from withholding taxes.

Preferred Creditor Status and Intercreditor Considerations

If a country experiences a severe shortage of foreign currency which threatens its ability to service foreign debt obligations then the relevant government will typically impose a moratorium on foreign currency debt servicing. Certain classes of creditor, including MLAs,[5] often benefit from preferential treatment in such circumstances. Multilaterals have, for instance, been excluded from debt restructurings[6] and have been given preferential access to foreign exchange reserves. Multilaterals can also benefit in other ways from this preferred status including exemption from withholding taxes. Commercial banks participating in a multilateral co-lending facility should also benefit from the multilateral preferred credit status. A number of intercreditor issues can however arise in project finance transactions if the multilateral agency and co-lenders benefiting from priority status are lending alongside other institutions which do not so benefit. ECAs are particularly sensitive to this priority status and have been known to refuse to lend alongside MLAs on account of this. Various intercreditor structures have been suggested to resolve this problem but the solutions are not perfect. The acceptability of any particular solution will usually depend on the specific circumstances of the financing.

3.3.4 Debt Capital Markets and Project Bonds

Debt capital markets are markets where debt securities or bonds are issued and traded. Borrowers are able to raise debt on capital markets by issuing bonds directly to investors. This is in contrast to bank loans whereby a bank acts as an intermediary and is situated between borrowers and depositors. The debt capital markets represent a large pool of liquidity for a variety of borrowers. Governments

5. Whether a particular institution will enjoy preferential creditor status or not is based on custom rather than law and whether the government in question is a member of that particular agency. For more detailed information see: www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+yndications/overview_benefits_structure/syndications/preferred+creditor+status
6. The Russian moratorium in 1998 on payments to foreign creditors is an example of the exclusion of multilaterals from a wider moratorium (see: http://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/ IFC_External_Corporate_Site/IFC+Syndications/Overview_Benefits_Structure/Syndications/Preferred+Creditor+Status/)

and corporates raise enormous amounts of debt by issuing bonds on these markets and the debt capital markets have been used to raise funds for projects. Incorporating a bond financing into a project finance structure is not, however, without its challenges and there are numerous instances where project sponsors have failed to raise funds on these markets.

Although bonds are similar to bank loans in that they represent claims for repayment of debt, there are some important differences which can have a significant impact on project finance structures. The terminology used in the debt capital markets is different compared to the syndicated loans markets and this can be a source of considerable confusion. Rather than lenders making loans to a borrower, for instance, issuers issue bonds to investors. For project bonds, the issuer may be the project company or, more commonly, a special purpose finance vehicle guaranteed by the project company. The issuer pays a coupon to the investors and the bonds are redeemed (as opposed to being repaid). Investors in the project bond markets are usually institutions such as pension funds, insurance companies, banks and so on.

The debt capital markets offer an extremely wide range of debt instruments each with its own specific features and characteristics. The most important commercial terms of a conventional bond include the maturity, the coupon rate, the covenants, redemption and security. Bonds can be of any maturity but are usually categorised into short-term (up to 5 years), medium term (5–12 years) and long-term (more than 12 years). Traditionally bonds have paid fixed coupons and the rate is usually quoted against government debt (for dollar bonds this would be the relevant US treasury rate for the given maturity of the bond). Floating rate bonds are also possible. Although bonds can be redeemed periodically, traditionally bond redemption occurs at maturity. To simulate the repayment profile of a traditional bank loan bonds structures for project finance may include sinking funds, which ensure that the borrower is reserving sufficient funds to redeem the bond at maturity.

A further difference between the loan and bond markets is the method of assessing the creditworthiness of the borrower or investor. Banks undertake their own internal credit appraisals of borrowers making use of their own internal credit departments and credit committees. In contrast, bond investors usually consult the credit ratings of issuers, which are published by several independent companies known as ‘credit rating agencies’. These agencies assess the creditworthiness of a particular bond issuance and classify their assessments according to a rating class. The credit rating agencies and the ratings process is examined in more detail in the following section.

The debt capital markets are also subject to a different regulatory environment in comparison to bank loans. Because bonds are sold directly to investors the regulatory environment for bonds has a much greater emphasis on investor protection. In general, the debt capital markets are regulated in a similar way to other securities markets including the stock markets and as has been already noted the regulation is focused on disclosure requirements.

Bond Issuance Process

The bond issuance process typically begins with the project sponsors or borrower approaching an investment bank or group of investment banks to structure and underwrite the bonds. These investment banks will sign a mandate letter and manage the issue. Once mandated the lead managers will advise on the most appropriate approach to the investors and prepare the necessary offering memorandum[7]. The bond issuance will be underwritten by the investment banks pursuant to an underwriting agreement which will be signed just prior to the issuance of the bonds.

An importance element of the issuance process is the rating of the bonds. This will involve an approach being made to one or more of the rating agencies that will analyse the issuer and make an assessment of the likelihood of default. The three ratings agencies that most commonly rate project finance issues are Moody's Investors Service, Standard & Poor's and Fitch Ratings. These rating agencies will assign a rating to the bonds based on their independent assessment of the investment risks. The bond rating forms the basis upon which the investors make their decisions to invest and the ultimate pricing of the bonds.

An issuance may be public or private. A public placement involves the issuer listing the securities on an exchange and raising funds from the widest possible pool of investors. The listing requirements of the exchange will have to be complied with including extensive disclosure and due diligence requirements and the involvement of a variety of external parties including lawyers and accountants. A private placement does not involve listing on an exchange and targets the issuance at a narrower pool of investors. The advantage of listing privately is that the issuance requirements are less onerous.

Bonds for Project Finance

Bonds have been successfully issued for a variety of projects in different locations. There are thus a number of precedent transactions which are generally referred to when structuring and issuing bonds for new projects. It should be recognised, however, that the majority of the bonds have been raised for infrastructure projects and the use of project bonds for oil and gas projects is much less developed. Those that have been successful have largely been dollar denominated private placement 144A[8] issues issued into the US market. Even for successful bond placements the incorporation of debt capital markets securities

7. An offering memorandum is a document that summarises the project and the terms of the project bonds. Different terminology is often used including the use of the term 'prospectus' for public (as opposed to private) placement. The content and scope of these documents is often subject to, and prescribed in, relevant regulations.

8. In the US bond markets, Rule 144A allows exemptions to certain types of bond offering. These exemptions significantly reduce Securities and Exchange Commission registration and reporting requirements. The rules are complex but broadly refer to bond offerings made to large and sophisticated investors.

into a project financing presents several challenges the most important of which are summarised as follows.

- *Availability of funds and drawdown*: Unlike loan drawings, bond proceeds are immediately available and the only way of replicating a loan drawdown profile is to make repeated issues as required.
- *Cost of carry*: The bond proceeds will usually be deposited in a dedicated account and used as needed. This results in an additional cost, as the coupon will accrue immediately following the issue.
- *Managing the investors*: Bond investors are generally passive and only expect to receive general information and notifications of default. Decision making from a group of bondholders is hence much more difficult compared to more conventional lenders.
- *Covenants and decision-making*: Bonds usually have a less restrictive covenant package compared to more conventional lenders and this reflects the passive nature of bondholders.

Structuring a bond financing into a multi-sourced complex oil and gas financing can therefore create a number of significant intercreditor issues, which need to be carefully addressed in the initial documentation.

3.3.5 Other Sources of Finance

There are a variety of other sources of finance that have historically played an important role in project finance. The following paragraphs describe Islamic finance, leasing, local banks and certain other specialist institutions.

Islamic Finance

Islamic finance is structured in such a way so as to comply with the principles of Islamic, or Sharia, law.[9] The motivation for using Islamic finance is that, by demonstrating compliance with the principles of Sharia law, borrowers and issuers of Islamic debt can gain access to Islamic institutions and thereby a much wider base of investors. A strong track record of successful Sharia compliant project finance now exists. Not surprisingly, Islamic finance has been an important source of financing for the Middle East project finance markets and a number of high profile oil and gas project financing transactions have successfully included Islamically structured funding. Islamic finance does, however, have some unique characteristics that need to be addressed when using this type of finance for projects.

Sharia is a complex set of laws, codes and rules. Although it is not possible to cover this subject in any great detail in this text it is important to understand the basic principles that underlie a Sharia compliant financing.[10] In summary,

9. Sharia Law is the legal system, which governs Islam and provides the basic code for Muslims. The Koran is the source of Sharia Law.

10. For a fuller discussion of the various Islamic structures for project finance see J. Dewar and M. Munib Hussain (2011), 'Islamic Project Finance' in Dewar (2011).

the most important concepts of Sharia of relevance to project finance include: the prohibition of interest, the avoidance of uncertainty in dealings and prohibition on speculative activities. In very broad terms the goals of Islamic finance are to ensure that there is a balanced relationship between parties and that there is an element of profit and risk sharing underpinning financial transactions. To achieve these goals various modifications are made to conventional project finance structures. The most important Islamic structural instruments for project finance are summarised as follows.

- *Istisna'a*: A procurement contract whereby payment is made by a buyer for goods to be delivered at a later date. In the context of project finance, an Istisna'a structure is used to finance the construction period of a project. The Islamic financiers appoint the borrower as their agent to procure the specific project assets to be financed Islamically.
- *Ijara*: A lease contract whereby a party is given a 'right of use' in return for a rental payment. The Ijara structure is usually used for the operational phase of a project financing in conjunction with an Istisna's structure during the construction phase.
- *Wakala*: An agency contract whereby the Wakil acts in an agency capacity on behalf of the financier.
- *Sukuk*: The Islamic equivalent of a bond, although rather than a debt claim the investor owns a share in the underlying asset. The Sukuk structure has been used on a number of project finance transactions in the Middle East.
- *Murabaha*: A credit sale agreement pursuant to which an agreed profit between a financier and a client is specified in a sale and purchase contract.

The most common structure for project finance is a combined Istisna'a–Ijara structure whereby certain identified project assets are procured by the Islamic institutions pursuant to an Istisna'a contract. The Islamic institutions then lease these assets to the project company pursuant to forward Ijara contract. This structure has been used on a variety of oil and gas projects in the Middle East and has also been combined with a Sukuk structure to issue Islamic bonds on certain Middle East projects. This structure can create difficulties when used alongside conventional financing especially in areas such as insurance and intercreditor arrangements. A set of precedent transactions now exist, however, which have addressed some of the most challenging issues associated with Islamically structured project finance.

Islamic finance is almost invariably part of a larger multi-sourced financing. The motivation to use project finance is often driven by the desire of one or more sponsors to widen the investor base in the project and bring in local Islamic institutions to the financing. The usual approach adopted to realise an Islamic financing is to structure the Islamic component as part of the wider project finance process and then to approach Islamic institutions to solicit their structural requirements and interest in the transaction. An important and unique part of this process is the need to obtain approval from an acceptable Sharia scholar. Different institutions and jurisdictions usually involve different scholars and this can create some inconsistencies in structural requirements. This is an important point to understand as any adjustments that need to be made to the financing structure in order to accommodate an Islamic scholar's requests will often impact the wider financing and hence could result in extensive negotiations between other finance parties which are not directly involved in the Islamic component. It is generally the case, however, that within any one jurisdiction there are now sufficient precedents to have confidence that commonly used structures are compliant with the relevant Sharia legal system by which the financing is regulated.

Leasing and Lease Finance

Lease finance is a method of funding that is based on the separation of ownership and usage of an asset. The lessor finances the acquisition of the asset and the lessee pays rent to the lessor in return for having the exclusive right to use the asset. The relationship between the lessor and lessee is governed by the terms of a lease agreement. In the context of project finance, the project company would lease the project assets from financial institutions (the lessor in this case would typically be a special purpose company established to borrow funds and purchase the project assets). Rather than financing all the projects assets, lease finance may be used to finance specific assets. This concept has, in fact, already been introduced in the previous section as part of the examination of Islamic finance structures and more particularly the Ijara arrangement. Leasing is especially appropriate when the separation of asset ownership and usage is common and straightforward. Assets which can be deployed for use by others or which are non-core to the rest of the project are often financed pursuant to lease-type contracts. A ship chartered for the long-term delivery of LNG, for instance, or an FPSO leased for a particular upstream project are typical examples of assets procured using lease finance structure. The separation of ownership and usage can result in significant efficiencies through specialisation. Again using the example of a leased FPSO, the FPSO operator can apply specialist skills which can improve the operating performance of the project overall. Charterparties for ships and other offshore infrastructure are dealt with in greater detail in Section 9.4.1.

There are also certain tax and accounting advantages associated with leasing structures. The owner of the assets will typically be able to claim capital allowances against taxable profits, which may result in tax savings. Tax considerations are especially relevant when dealing with different jurisdictions and several tax authorities. The accounting treatment of particular lease transactions may also be beneficial. Leasing does have an important role to play in project financing although it is generally encountered as a structural enhancement either as a better way to manage risk transfer (through, for instance, the chartering of ships or offshore infrastructure) or to maximise tax benefits. It has already been shown in the previous sector, for instance, that leasing is a concept used in Islamic finance to help achieve Sharia compliance.

Local Banks and Specialist Institutions

Local commercial banks are often an important source of funding for domestic projects. Although these banks tend to have a limited presence in the global financial markets, in certain jurisdictions where significant funds have been raised for project financing, local banks have become highly experienced and knowledgeable in project finance. In Saudi Arabia, for instance, local banks have a long track record in financing large domestic oil and gas projects and have structured and funded a number of transactions without international bank participation.

There are a number of advantages in including local banks in a project finance transaction and developing a funding strategy which makes provision for local banks. Local institutions usually maintain close relationships with local joint venture partners and are often able to offer better services to the project company, such as local bank account functions. Although local banks generally have less access to liquidity through the global interbank markets, these banks may be able to provide more competitive funding due to cost advantages including, for instance, exclusion from withholding tax regimes. In addition, local banks can often offer more competitive funding in domestic currency if required.

In addition to local commercial banks, in many jurisdictions specialist institutions exist, which can provide competitive and attractive funding for project finance. In Saudi Arabia, for instance, the Public Investment Fund[11] and Saudi Industrial Development Fund[12] have both been important sources of liquidity for downstream projects in the Kingdom.

3.4 THE GLOBAL PROJECT FINANCE MARKET

Project finance is part of the global wholesale debt market, which deals in transactions between companies, banks and governments (as opposed to individuals). The wholesale financial markets cover a wide range of transaction types including money markets (short-term markets), debt markets, stock markets, commodity markets and foreign exchange markets. Although the project finance market is connected to and influenced by all of these wider wholesale markets it has traditionally been most closely associated with the wholesale syndicated loans market. The characteristics of the syndicated loans market will be covered in more detail in the following chapter. In summary, however, this is a private market (and hence not organised on a public exchange) where banks and other financial institutions provide various types of loan to a variety of different borrowers, principally governments and companies. This market covers around US$ 4,000 billion of loan transactions each year and is concentrated in the main financial centres of London, New York, Singapore and Tokyo together with other regional markets. As part of this wider global market, project finance

11. See www.mof.gov.sa/english/Pages/investment.asp
12. See www.sidf.gov.sa/en/Pages/default.aspx

market represents roughly US$ 300 billion of transactions each year, which is equivalent to less than a tenth of the wider syndicated loans market. In the context of the wider financial markets, therefore, the project finance market is relatively modest.

Although project finance is a private market, information on transactions is available through various organisations including Thompson Reuters, Euromoney and Dealogic.[13] These organisations publish regular information of deal activity and compile league tables on a regular basis which summarise the activities of the major players active in the market. Table 3.1 summarises the project finance market information for 2010–2014 from Thompson Reuters.

TABLE 3.1 **Project Finance Market Information for 2011–2014**

US$ million	2011	2012	2013	2014
Europe	83,339	67,902	88,960	95,087
Americas	38,383	39,320	51,420	92,884
Asia	91,763	91,522	63,646	72,279
Total	**213,486**	**198,745**	**204,026**	**259,724**
Power	80,498	66,307	69,379	83,533
Oil and gas	38,834	60,233	39,562	66,005
Petrochemicals	4,614	4,417	10,719	11,189
Infrastructure	89,540	67,788	84,366	98,997

Source: adapted from Thompson Reuters' annual project finance league tables.

On a regional basis the market is divided into the Americas, EMEA and Asia Pacific and deal activity is spread reasonably equally across the regions. The most active area in project finance in recent years has been Asia representing around 35% of the total project finance market. Asian project finance activity has been particularly driven by infrastructure finance in India and the natural resources sector in Australia. In terms of the industrial sectors, the most active sectors have been infrastructure, power generation, and oil and gas. These sectors each account for around US$ 100 million to US$ 150 million of transactions each year and in total make up approximately 40% of the global market. The oil and gas sector is covered in more detail in Section 14.4.

Turning to the major players in the market, on the funding side the international commercial banks have historically dominated the sector. The largest commercial bank providers of project finance debt in 2013 are listed in Table 3.2.

13. www.pfie.com/, www.euromoney.com, www.dealogic.com/

TABLE 3.2 Largest Commercial Bank Providers of Project Finance Debt in 2014

US$ million	2014	Market Share
Mitsubishi UFJ	16,227	6%
SMBC	13,451	5%
Mizuho Financial	9,848	4%
BNP Paribas	9,003	3%
Credit Agricole	8,054	3%

Source: adapted from Thompson Reuters' annual project finance league tables.

The rankings of the various financial institutions in the annual league tables can vary quite considerably depending on specific deals closed and particular circumstances in a given year. In general, however, the most active banks in the project finance markets are also the most active in the international syndicated loans markets.

Chapter 4

Commercial Banks and Syndicated Lending

Chapter Outline

4.1 INTRODUCTION

Although there is a wide variety of debt finance available for projects, commercial bank loans have traditionally played the most important role in the project finance markets. The purpose of this chapter is to explain the role of commercial banks in project finance and to examine how syndicated loans are raised in practice for project finance transactions.

Section 4.2 covers some of the features of commercial banking that are of most relevance to project finance. It is important to understand the impact of banking regulation on the approach commercial banks take when considering project finance opportunities. It will be seen that the regulation of bank capital has had a particularly strong influence on the behaviour of project finance banks.

Section 4.3 then goes on to look in more detail at the commercial banking lending techniques that are most relevant to project finance. Term loans form the basic structure for the vast majority of project finance transactions and the structures of these loans are influenced mainly by the requirements of the commercial banks and syndicated loans market. This section will therefore focus on the main features of term loans and explain how these loans are applied to project finance. Other commercial banking products, such as revolving credit facilities, letters of credit and the like, will also be briefly covered.

Section 4.4 then moves on to the workings of the syndicated loans market and how bank syndicates function in the context of project financing. The syndicated loans market has developed over several decades and has developed its own practices and terminology. The most important features of the market will be covered in Section 4.5.

4.2 THE ROLE OF COMMERCIAL BANKS IN PROJECT FINANCE

The importance of commercial banks in the project finance markets reflects to a large extent the experience these institutions have in providing flexible long-term cross-border loans to borrowers in many different jurisdictions. In addition, commercial banks are uniquely placed to provide certain other essential services to project finance borrowers including payment services and account bank functions, foreign exchange and derivatives services, working capital facilities, letters of credit, guarantees and performance bonds.

4.2.1 The Nature of Commercial Banking

Commercial banks act in a classical intermediary role by accepting deposits from savers and extending credit to borrowers. Through this intermediation role, commercial banks perform a vitally important economic function. Without banks acting as intermediaries, savers with surplus funds would have to identify their own investment opportunities and would be taking direct risks on their investments. Intermediation benefits the financial markets by reducing transaction costs, spreading risk and realising economies of scale and specialisation. Financial intermediation also involves a high level of risk. Depositors are placing significant trust in banks to manage credit exposures and ensure that depositors' funds are safe. The potential for catastrophic failure in the financial markets due to a loss of trust in banking intermediation is a real risk. As a result the banking sector is a prime target for government regulation.

In addition to the classical activities of deposit taking and lending, commercial banks also perform a variety of other important functions as part of the intermediation role. Payment systems are essential in the management of monetary transfers. Commercial banks provide this vitally important service and are responsible for managing payment systems to ensure the efficient movement of funds between accounts. Banks also form a critical component of the global foreign exchange system. In addition, banks have broadened their range of activities and are now involved in insurance, leasing, risk management and capital markets activities. Many of these products and services are essential for the proper functioning of a project finance transaction.

Banks earn their core income by charging higher rates of interest to borrowers compared to those paid to depositors. The interest earned on lending must be sufficient not only to cover interest costs but also to cover any losses made on lending, administrative expenses, overheads and returns to shareholders who provide the capital to run the business. In addition, commercial banks have increasingly earned income from ancillary business including investment banking and brokerage, capital markets activities, insurance and so on.

4.2.2 Wholesale and International Banking

Wholesale banking activities are concerned with the large-scale movement of funds in the financial markets. Although this movement of funds takes place between a variety of financial institutions, large corporations and governments, lending between banks (interbank lending) is particularly important and tends to dominate the wholesale markets. Interbank lending allows banks to manage their funding and investment requirements by borrowing or lending funds to one another. Interbank borrowing and lending is a major part of banks' treasury operations and, as a result, the interest rate that banks charge on their loans tends to reflect the cost of borrowing funds on the wholesale interbank markets. A variety of interbank benchmarks are used to set interest rates in syndicated loan agreements the most common of which for international US dollar loans is the London Interbank Borrowing Rate (LIBOR).[1] Other regional markets have similar rates including Euro Interbank Offered Rate (Euribor), which is used for Euro based loans.

Wholesale banking is also closely related to international banking which is concerned with the provision of banking services outside the domestic jurisdiction of a particular bank. A UK bank providing US dollar loans to a borrower located in Kazakhstan but domiciled in an offshore jurisdiction is an example of an international banking transaction. Although there are many types of international banking transactions the most common include: trade finance in support of imports and exports, foreign exchange trading and international payment services. There are a variety of different ways commercial banks operate internationally. At the most basic level a bank can utilise the services of correspondent banks. Banks can also set up representative offices, branches and subsidiaries. International banks also tend to source financing from a variety of different areas including listing on multiple stock exchanges, borrowing on the international capital markets and so on.

4.2.3 Regulation of Commercial Banking

Commercial banking is one of the most heavily regulated sectors in the global economy and the costs to banks of complying with multiple different types of

1. LIBOR is based on the estimated rate of interest that is charged between banks in the London interbank market. The rate is calculated for a variety of currencies and loan maturities based on a bank submission process administered by the Intercontinental Exchange. LIBOR is also used as a basis for determining payment obligations in a variety of other financial contracts, including derivative contracts such as interest rate swaps and foreign currency contracts.

regulation are considerable. Commercial banks occupy a central position in a complex financial system operating across national boundaries. Through the interbank markets, banks are heavily dependent on each other and the consequences of a single bank failure are potentially catastrophic. The international nature of the industry means that, in addition to domestic regulation, close coordination is required between national regulators at a global level. As a result banking regulations are complex, onerous and often involve multiple regulatory authorities in different jurisdictions. In addition, banking regulation covers almost all commercial banking activities and the conduct and behaviour of banks in their business dealings are strongly influenced by their regulatory obligations. When negotiating project finance loans, banks will be extremely careful to ensure full compliance with relevant regulation, and regulation can therefore be a significant factor in determining the structures and terms of project finance loans.

The principle aims of bank regulation are to control bank activities and ensure that the financial system is not threatened by the failure of individual institutions. These aims are achieved through a process of authorisation and licensing of deposit taking activities usually by a central bank or a specialist supervisor. Each jurisdiction has its own national regulator and hence global banks operating internationally are subject to multiple levels of regulation. The most common controls imposed on commercial banks by the relevant authorities include controls on the adequacy of a bank's capital, restrictions on large exposures, adequacy of liquidity, systems and controls, ownership and management and foreign exchange risk. Government authorities may also impose severe restrictions on particular banking activities including, for instance, the ability of banks to operate in certain jurisdictions or transact with particular counterparies. Country and industry specific sanctions are particularly relevant to the oil and gas sector.

In relation to project finance, the regulation of bank capital has had a particularly noticeable impact on the terms of finance which banks are able to offer in the syndicated loans market. It is therefore necessary to outline the main features of the international capital adequacy rules in order to understand the issues which commercial banks currently have to contend with. The most important international protocols which govern capital adequacy are those established by the Basel Committee on Banking Supervision (see Section 1.3). The Basel Committee has published and updated a set of international criteria which aim to harmonise the minimum capital requirements of banks. In this way the committee has attempted to both create a more secure banking industry and a level playing field between banks operating under different national regimes. The original Basel committee accord, known as Basel I, stipulated a minimum capital adequacy ratio of 8%, which is applied to the risk weighted assets of a particular institution. The risk weighting system is based on four risk classes.[2]

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2. These four classes are: (1) no risk (cash, etc.), 0% weighting, (2) low risk (short-term credit), 20% weighting, (3) moderate risk (mortgages, etc.), 50% weighting and (4) standard risk (corporate loans), 100% weighting. See bis.org /publ/bcbsca.htm

The Basel I accord also defines capital on the basis of its division into two elements namely Tier 1 (core capital) and Tier 2 (capital base).

Although Basel I did succeed in formulating a standard set of rules for bank capital the accord was heavily criticised. As a result, Basel I was superseded by Basel II which was implemented in 2004. The most significant changes introduced by Basel II concern the methodology for calculating the risk asset weights and, in particular, attempting to match the risk weights more closely to underlying credit risks. The resulting framework involves a set of complex rules and guidelines, the most important of which deal with the various models for determining credit risk weights.

In response to further severe criticism resulting from the various bank failures during the 2008 global financial crisis further revisions are proposed to the Basel framework and these are currently being considered. The Basel III Accord imposes stricter capital requirements on commercial banks and, in addition, brings in new balance sheet constraints including a liquidity ratio test on banks' total assets and capital. The impact of Basel III on the project finance market has been significant. The most immediate impact on banks has been a general increase in the banks costs of funds. The additional capital requirements have also resulted in banks being generally more constrained on their ability to lend. The longer tenor loans have furthermore created funding challenges due to the new liquidity rules. It is difficult to predict the long-term implications of Basel III for project finance although long tenor loans could become significantly more expensive and some banks may decide that project finance is no longer an attractive business to be involved in.

4.2.4 Commercial Banking and Project Finance

Commercial banks regard project finance as part of their wider lending activities and they tend to approach this business in broadly the same way that they approach other types lending activities. Lending forms a core activity of commercial banking and banks operate sophisticated lending functions designed to originate, execute and then monitor the extension of credit to a variety of borrowers. In making a loan, an individual bank aims to ensure that it earns an adequate return on capital for the credit risks it is taking and hence the management of credit risk is a central commercial banking function. Credit strategies and policies are established to define the level of risk that a particular institution is prepared to accept and adherence to these credit strategies is managed through a credit risk assessment process. A loan cannot be made unless the credit risks have been fully approved. Once a loan has been made, monitoring procedures are required to ensure that exposures are controlled and any deterioration in the credit exposure is properly managed.

Project finance competes for capital with the other businesses of commercial banks and hence it is important to understand how project finance compares to the other revenue generating activities. The view generally taken by commercial banks is that project finance consumes significant capital over long periods of time and is labour intensive. Many banks find it difficult to justify the capital and resource commitment to project finance and hence may not recognise project finance as a separate lending activity. These banks may still participate in project finance loans but only as part of wider activities and are unlikely to have the resources and capabilities to structure and manage project finance activities at a senior level. Other banks make a strong commitment to project finance over the long term and structure and resource themselves to operate at a senior level in the sector. The most sophisticated banks will be able to offer a full range of project finance services and will have capabilities in advisory, agency, capital markets, cash management services and so on.

In terms of the way banks are organised for project finance, this form of lending requires specialist skills in structuring, marketing and credit risk analysis. As a result, banks often establish separate project finance teams, which originate, execute and monitor the project finance business. Banks may also organise their project finance activities as part of wider industry teams or particular sectors of the financial markets. Some banks, for instance, include project finance in their investment banking activities rather than commercial banking. However organised, banks' approach towards project finance is often driven to a large extent by the relationships that the banks have with their core customers. Project or structured finance departments will therefore also work closely with their general relationship management departments. For many banks, project finance is an important part of the wider product offering to its customers and is often an essential product to deepen customer relationships and win ancillary business.

4.3 TERM LOANS AND RELATED FINANCING

Project finance loans are in essence term loans with enhanced features to accommodate the specific characteristics of project cashflows. Term loans are loans that banks provide on a committed basis for an extended period of time and are repaid in scheduled instalments over the term of the loan. Although term loans form the basic funding structure for project finance, commercial banks provide a variety of other related financing which are commonly used in project finance structure.

4.3.1 Term Loans

Term loans allow borrowers to make repayments over contractually agreed extended time periods. In the context of the loan agreement this extended period is known as the repayment period. In contrast 'on-demand' loans allow the lender to demand repayment of the loan at any time. Given the fact that commercial banks fund themselves largely through short-term deposits, the most satisfactory arrangement for a bank is to extend credit on-demand. This situation is, however, clearly not attractive to borrowers. The bargaining power is firmly with lenders and the borrower is trapped in a position of great uncertainty. The term loan forms a much more balanced relationship between lenders and borrowers, wherein, if the borrower complies with the terms of the loan agreement, the lenders are not able to demand repayment.

The ability to contractually fix repayments is especially important in project finance, which, as we have seen, is based on the cashflow profile of the underlying project. Without the certainty of the timing of debt repayment it would be virtually impossible to enter into the financial commitments required to develop a project. To fully understand the concept of project finance it is thus essential to understand the nature and structure of basic term loans. The following sections examine these topics in more detail and explain some of the more complex features which are encountered in project finance.

Nature of Term Lending: Lender–Borrower Relationship

When making term loans to borrowers, commercial banks are exposing themselves and their depositors to the risk that the borrower is unable or unwilling to meet the scheduled repayments. To remain in this type of business a competent banker will need to understand the business activities of its borrowers and develop relationships based on trust and the open flow of information. A further feature of term lending is that, in the normal course of business, the lender is not in a position to manage the borrower's activities. Lenders therefore want to ensure that the borrower has the ability to effectively manage its business and generate sufficient cashflows in order to repay the debt. Term loan agreements therefore include a range of covenants whereby the borrower promises to do and not do certain things. These covenants allow the lenders to exert some constraints over the way borrowers' run their businesses.

If the borrower's business does get into trouble, lenders want to ensure that they can demand repayment of the full amount of debt. The debt in this case is said to be accelerated and the contractual repayment profile originally agreed no longer applies. Lenders normally have the right to accelerate the loan once the borrower defaults on its obligation under the loan agreement. The loan agreement therefore includes a range of 'events of default' which allow the lenders to take action to recover their debt. The aforementioned provisions are designed to enable lenders to exert control over the borrower. To manage the relationship properly lenders also need to ensure that they are monitoring the borrower and its financial condition. Commercial banks typically put in place dedicated teams to monitor lending exposures. Borrowers will agree to a variety of reporting obligations so as to enable the lenders to monitor the performance of the loan.

All of the provisions and mechanisms examined so far apply generally to term loans. Lenders to a project financing typically have even greater exposure than normal to the underlying performance of the borrowers business. In addition, during the construction period of the project there is no servicing of debt for an extended period of time. Lenders will therefore normally insist on even more control rights than normal and it is absolutely essential to understand why this is of such importance to commercial banks.

Basic Term Loan Structures

The basic structure of a term loan forms the foundation of project finance lending and hence it is important to understand the main elements of a term loan and why these are needed. Although far from being standardised, there are many standard features of term loans that have developed out of market practice and regulation. The syndicated loans market, in particular, has developed standardised documentation mainly through the influence of the Loan Market Association[3] (LMA). The activities of the LMA will be examined in more detail in the next section. A term loan agreement will typically cover: drawdown and purpose of funds, repayment, lender protections and loan economics and pricing.

Drawdown and Purpose

The basic form of a term loan involves the lender making a commitment to advance funds to a borrower over a specified period, known as the 'commitment period'. During the commitment period a borrower is able to request funds up to the total committed amount of the loan. Before requesting an advance of funds, however, the borrower is obliged to fulfil a variety of conditions precedent. The purpose of the conditions precedent is to ensure that the borrower has complied with all required documentation and formalities and has confirmed the accuracy of specific information and facts concerning the loan. Given the complexity of project finance structures, drawdown procedures and conditions precedent are generally more involved compared to corporate finance transactions. The conditions precedent will, for instance, usually be extensive and will include the delivery of significant volumes of information concerning the project. The commitment periods for the underlying loans are also typically much longer than normal reflecting the extended funding period during which the project company will continuously draw funds pursuant to the loan agreement.

Lenders are also concerned to ensure that the purpose of loan drawings are transparent and in accordance with the agreed terms of the loan. This is particularly important for project finance loans as lenders want to ensure that the loan proceeds are used to fund identified project costs. In some cases, the lenders may require independent verification that the loan proceeds are being used for defined purposes.

Repayment and Tenor

At the end of the availability period the loan is normally fully drawn (if the loan has been only partially drawn then all commitments will be cancelled). The

3. The Loan Market Association is a membership organisation established in 1996 and has as its key objective improving liquidity, efficiency and transparency in the primary and secondary syndicated loan markets in Europe, the Middle East and Africa. See www.lma.eu.com

borrower is then obliged to start repaying the facility. The simplest form of repayment is the situation whereby the borrower agrees to make equal instalments until the full amount of the loan has been repaid. At the other end of the spectrum the borrower could make repayments via a single repayment at the end of the loan period. This type of repayment profile is known as a bullet. There are an almost infinite number of variations between these two extremes and the choice of the most appropriate profile is an important element of the structuring of project finance loans.

The length of time to the final repayment is called the tenor of the loan. Lenders are particularly sensitive to loan tenors. All other things being equal lenders would rather lend for shorter rather than longer tenors. The longer the tenor, the greater the uncertainty that the loan will ultimately not be repaid. For corporate loans, tenors for term loans rarely exceed 5 years. For project finance loans, the tenors can be very much longer which is a reflection of the cash flow profiles of the underlying projects. This will be discussed in more detail in Section 17.4.4.

Lender Protection Mechanisms

Given the potentially very long tenors over which lenders are exposed, the term loan structure presents significant risk, especially as the lenders have limited control over the activities of the borrower. This situation is acceptable provided there are no difficulties and the borrower fulfils its obligations to repay the debt on time. Lenders do, however, need to ensure that their capital is protected in the event that things do not go according to plan. As a result a variety of protection mechanisms are built into term loan agreements. These include covenants, events of default, rights to accelerate repayment and rights to enforce security. These protection mechanisms are of fundamental importance in project finance and will be explored in detail in later chapters.

Loan Economics and Pricing

In return for extending credit to the borrower lenders expect to earn a return on the outstanding loan through the payment by the borrower of interest. The calculation of interest is based on banks' own cost of funds plus a margin, which varies depending on the perceived risk of the transaction (higher margins for riskier loans). It may be that the loan is not fully drawn but that the balance of the loan is still available for drawing. The lender is then still committed to lend if the borrower requests an advance. In these circumstances the lender will charge a commitment fee on the undrawn amount of the loan. Lenders also charge a variety of other fees, the most important of which is an upfront fee that is normally payable within a short period of the loan agreement having been signed.

The calculation of loan interest is based firstly on the lenders' cost of funds. Syndicated loan agreements make reference to the cost of funds in the interbank lending markets as a basis of the interest calculation, the theory being that banks fund themselves on the interbank markets and hence the cost of making a loan is equal to the cost of funding on the interbank market. Various published interbank lending rates are used to determine funding costs (see Section 4.2.2).

4.3.2 Other Types of Credit

The previous section described the basic features of a term loan facility. Banks also provide various other types of credit, many of which have relevance to project finance. An important feature of a term loan facility is that once a repayment has been made the amount cannot be redrawn. In contrast, a revolving credit facility does not have a scheduled repayment structure but allows the borrower to draw and repay the loan continuously throughout the term of the facility. This type of loan is often used for working capital purposes.

Commercial banks also provide various types of credit support facilities including guarantees and letters of credit. Guarantees and letters of credit from commercial banks are used for a variety of purposes in project finance. We will see later, for instance, that the lenders to a project usually expect to benefit from reserve accounts for a variety of reasons. Rather than having cash in the reserve accounts, however, the lenders may allow the project company to provide letters of credit from suitably credit worthy banks for the benefit of the project lenders.

4.4 SYNDICATED LENDING

A syndicated loan is a loan made by a group of banks acting together as a syndicate.[4] By spreading the credit risk amongst a wider set of lenders, syndication allows borrowers to access larger sums which would otherwise not be possible from a single institution. The lending syndicate extends the loan pursuant to a single loan facility and thus, as far as the borrower is concerned, the loan represents a single loan obligation. Although in theory the fact that banks are working in a syndicate should not change the nature of the term loan, in practice the workings of a syndicate can have a considerable impact on the terms of the underlying loan and the mechanism by which the loan is provided.

Given the size of funding required for large projects, syndication is normally the only feasible option when sponsors of a project finance transaction seek to raise funds from commercial banks. As a result, to successfully understand the approach commercial banks adopt to project finance transactions it is essential to be aware of the terminology and practices commonly used in the syndicated loans market.

4.4.1 Terms of a Syndicated Loan

The main practical differences between a bilateral and a syndicated loan result from the need to manage and work with a group of banks. The number of

4. In contrast a loan made to a borrower by a single bank is known as a 'bilateral loan'.

banks in a syndicate can range in size from just two or three to over a hundred. In the larger syndicates the diversity of the different institutions can present significant challenges. Practical difficulties arise because each member of the syndicate has its own institutional operational constraints and working methods. Decision-making and communication can become highly complex when dealing with even relatively small syndicates.

An important feature of a syndicated loan, which needs to be understood, is the role of the facility agent. The facility agent occupies a central position in the management of the loan agreement and the borrower deals with the syndicate through the facility agent. The facility agent performs a number of important functions including centralising the payment of funds, fixing interest rates, organising and administering decisions and so on. Given the extensive control rights that lenders have in a project finance transactions, decision-making is especially important in this type of financing. The facility agent thus performs a vital function in the operation of project finance loans.

The relationship between the various members of the syndicate also needs to be understood. Although the lenders provide a single loan to the borrower, each bank makes a separate commitment to lend and is liable only for its share of the loan obligations.[5] If one lender fails to lend then the other lenders are not responsible for the shortfall. In terms of funds received, the syndicate operates on the basis of 'pro rata' sharing, which means that funds are shared fairly among the syndicate members and no member should receive more than its proportionate share.

The terms of a syndicated loan agreement will therefore need to address these various relationships between the syndicate parties, the borrower and the various agents that are required to ensure the loan operates effectively. The process for bringing together a lending syndicate involves some complexity and will be explored further in the following sections.

4.4.2 Primary Syndication

The primary syndication market is concerned with the solicitation and origination of funds from potential lenders, whereas secondary syndication refers to the process whereby loans are traded between different institutions.

Primary Syndication Process

The objectives of borrowing in the syndicated loans market are to raise the maximum amount of debt on the best possible terms and at the cheapest possible cost. To achieve these objectives a borrower will need to carefully manage a variety of relationships between the various banks that operate in the syndicated loans market. There are no particular rules or regulations that determine how funds are raised from the syndicated loans market and many of the working

5. In legal terminology each lenders' obligation is 'several'.

methods have developed out of market practice over the past several decades. To further complicate matters, the syndicated loans market has evolved its own language and terminology.

The traditional method of raising funds from a bank syndicate is known as ‘arrange, underwrite and distribute’. Using this model the borrower appoints a single bank or a small number of banks to arrange the financing. The borrower negotiates the structure of the financing with the arrangers and agrees the terms of the financing. The arrangers will then underwrite the full amount of the financing and negotiate the loan documentation. The arrangers traditionally invite other banks into the syndicate at this stage and hence the group of banks underwriting the facility will usually be larger than the arranging group. Once the facility has been signed the arrangers and underwriters proceed to distribute the loan to other banks pursuant to a process of ‘general syndication’. A simple example serves to clarify some of the more important concepts and terms. We will assume that a borrower, B, wants to raise US$ 500 million from a syndicate of banks.

- Firstly, B will approach a group of experienced banks, which will usually be its main corporate relationship banks. These banks will be invited to submit financing proposals including terms and pricing. We will assume that B mandates two banks A1 and A2 as mandated lead arrangers (MLAs) on the basis of a US$ 500 million loan priced at 250 bps[6] margin with a 150 bp upfront fee. An arrangement fee of 10 bps will be kept by A1 and A2.
- Secondly, the lead arrangers will invite other institutions to underwrite the financing. These banks could be the losing bidders in an initial funding competition. We will assume that three additional banks, U1, U2 and U3, join and agree to underwrite half of the loan amount based on an underwriting fee of 20 bps. A1 and A2 will therefore underwrite US$ 250 million or US$ 125 million each. U1, U2 and U3 will underwrite a further US$ 250 million or US$ 83.33 million each.
- Thirdly, the five banks will negotiate documentation and sign the loan facility allowing the borrower to draw down the loan.
- Finally, once the loan is drawn, the arrangers and underwriters will organise a general syndication. This will normally involve the arrangers and underwriters sending a full package of information to a wide group of banks. Banks will be invited to commit to lend on the basis of set ticket sizes[7] and pricing. We will assume that five banks join in general syndication and at US$ 20 million each for a total of US$ 100 million. These banks are known in the market as participants, P1, P2, P3, P4 and P5. Each participant will receive a participation fee of 120 bps.

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6. ‘bps’ refers to the term ‘basic points’. A basis point is commonly used to express interest rates. One basis point is equal to one-hundredth of a percent. So 1% is equivalent to 100 bps.

7. ‘Ticket size’ refers to the monetary amount of a transaction and is a commonly used term in the wider financial markets.

Table 4.1 summarises the overall result of the syndication:

TABLE 4.1 Overall Result of the Syndication

US$ million	Arrangement stage	Underwriting stage	Final hold*
Arrangers	500	250	200
Underwriters	–	250	200
Participants	–	–	100
Totals	**500**	**500**	**500**

**Final level of loan exposure which a particular institution is targeting following signing and general syndication.*

The fee split between the banks can be complex. The total fee paid by B is US$ 7,500,000, which represents 1.5% of the US$ 500 million loan. All ten banks will earn 120 bps on their final participation amounts. The two arrangers and three underwriters will earn 20 bps each on their underwriting amount and the two arrangers will earn 10 bps on half the facility amount. The final fee split is therefore summarised in Table 4.2.

TABLE 4.2 Final Fee Split Among Banks

US$ '000s	A1	A2	U1	U2	U3	P1	P2	P3	P4	P5	Total
Arrangement	250	250									500
Underwriting	250	250	167	167	167						1,000
Participation	1,200	1,200	800	800	800	240	240	240	240	240	6,000
Total	**1,700**	**1,700**	**967**	**967**	**967**	**240**	**240**	**240**	**240**	**240**	**7,500**

The total fee of US$ 7,500,000 is split between an arrangement fee of US$ 500,000 paid to the two arrangers, an underwriting fee of US$ 1,000,000 paid to the arrangers and underwriters on the basis of the amount underwritten and a participation fee based on the final hold amounts. The arrangers earn a total of US$ 1,700,000 each based on taking the largest final holds and earning underwriting and arranging fees. The underwriters earn US$ 967,000 each based on their final holds and an underwriting fee. The participants earn US$ 240,000 each based on their hold amounts only.

In addition to the absolute level of fee income, the banks will be acutely aware of their relative positioning in the transaction. There is a level of prestige attached to the various titles, status and hierarchy of the lenders in a syndicate. Titles and status determine league table positioning and are important in marketing activities for new business opportunities. Leading banks in the sector can gain significant advantage over their competition by achieving high league table status. For strong borrowers, the competition to arrange and underwrite transactions is thus severe and should be reflected in price of loans.

Mandate Letters, Commitments and Term Sheets

To ensure that the syndication process works properly it is imperative that the rights and obligations of various parties are clearly agreed, understood and documented. It is essential, for instance, that the borrower has the certainty of a funding commitment. This is a particularly relevant issue for project finance as the project company will enter into high-value contracts for the development of the project and needs assurance that funding will be available to honour payment obligations under these contracts. In reality, borrowers only have absolute certainty of funding once loan agreements have been signed and conditions precedent fulfilled. Prior to this stage, however, borrowers and project sponsors should ensure that the obligations of the banks are clearly defined. The terms of the bank commitments are detailed in a number of important legal documents which form the basis of the syndication process. Figure 4.1 provides a summary of the key documents and milestones in a syndicated loan process.

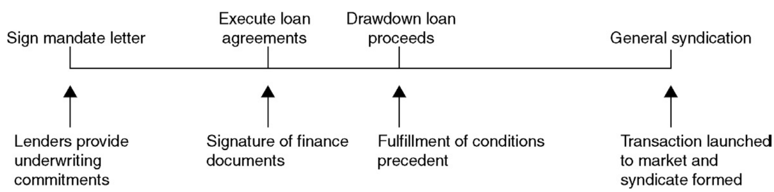

FIGURE 4.1 Summary of the key documents and milestones in a syndicated loan process. *(Adapted from LMA Guide to Syndicated Leveraged Finance.)*

The first agreement to consider is the mandate letter. The purpose of this agreement is to define exactly what the arrangers are being mandated to do. The letter will include provisions dealing with the agreement to underwrite, the titles and roles of the arrangers, the amount and pricing of the commitments and costs. The letter will also deal with the mechanics of the syndication including how the borrower will be involved, preparation of an information package, access to data and so on.

The arrangers will be mandated on the basis of agreed terms of financing which are typically documented in a term sheet. While there is no accepted standard form, term sheet and a range of different styles are commonly used, there are certain typical characteristics. In addition, the LMA has produced a form of term sheet, which is designed for use in the syndicated loans market.[8]

8. See www.lma.eu.com/landing_documents.aspx

The form of term sheets varies considerably from a few pages to several hundred pages. At a minimum, however, the term sheet will include the loan amount and tenor; interest rates, margins and fees; the repayment schedule; drawdown and availability periods; covenants, events of default and conditions precedent; and the proposed security package.

Underwritten and Club Syndication

Underwriting is an important concept but in reality is difficult to define exactly. A transaction is underwritten when an institution or group of institutions agree to lend the full amount of a facility and to take the risk of selling the exposure into the wider syndicated loans market. If the price and/or risk of the financing are not acceptable to the wider banking community then the underwriters will be unable to fully syndicate and will be left holding more of the debt than anticipated. Using the example given earlier, the five underwriters, A1, A2, U1, U2 and U3 have agreed to underwrite the full US$ 500 million of debt. The borrower is therefore certain that the funding will be provided. Let us assume that the two arrangers in fact both targeted final hold amount of US$ 75 million each as opposed to the US$ 100 million achieved. After the general syndication (which raised US$ 100 million from five banks) the arrangers are left holding US$ 25 million more than targeted. In practice this could mean that the arrangers subsequently need to reduce their exposures in the secondary markets, potentially at a significant discount. The cost of an unsuccessful underwriting can therefore be considerable.

Underwriting any transaction requires considerable skill, particularly for project finance. The key to a successful underwriting is pricing and, given the complex nature of risks and structures, project finance loans can be particularly difficult to price. Pricing a transaction correctly requires a full understanding of the perception of transaction risks and returns in the wider lending community. The underwriter therefore has to understand the risk profile of the transaction but also the risk appetite in the market. Project finance transactions can be especially difficult to underwrite given that the risk profile of the loans is usually complex and requires significant skill and analysis to understand. It is not surprising, therefore, that underwriting has become less common in the project finance markets. An alternative route is to fully fund the financing with net-take commitments from a group of lenders without underwriting. In other words the financing is already effectively fully syndicated by the time the commitment letters are signed. This form of syndication is known as a 'club' financing and has been applied to a number of very large syndicates. A further advantage of club syndication is the absence of any underwriting fees. The disadvantage from the borrowers point of view is the requirement to negotiate with a larger group of banks and hence increased uncertainty that funding will be available.

4.4.3 The Secondary Market

Secondary sales take the form of transfers between banks of syndicated loan exposures. The secondary market for syndicated loans provides important liquidity for banks to manage their loan exposures and has become an increasingly important activity in the project finance market. It is, however, more difficult to transact secondary sales in the syndicated loans market compared to other markets and there are a number of important issues that need to be understood.

Lenders value the ability to transfer loan participations for a variety of reasons. By partially or fully transferring loan exposures to other institutions, lenders are able to manage their exposures to borrowers, sectors and countries. Secondary trading also enables banks to manage their capital adequacy ratios. The secondary market is often used by banks to reduce their exposure when borrowers run into financial difficulties. Banks may also use the secondary loans market to trade loans for a profit. Syndicated loans are bought and sold informally between institutions and the responsibility for secondary sales activities usually resides with a bank's syndications teams. Secondary market traders will contact their counterparts at other banks with offers to buy or sell single loans or collection of loans. Prices are quoted as a single figure incorporating a premium or discount to the loan amount. A US$ 20 million loan, for instance, quoted at 98 will mean that the buyer will purchase the loan for US$ 19.6 million. The buyer is effectively being paid a 200 bp, or US$ 400,000, fee. The actual level of the fee depends on a variety of factors including the quality of the borrower, the general situation in the loans markets and the interest in the market from other institutions. The distressed loans market is a specialist area of the secondary loans market. The discounts for distressed loans can be large with sellers realising significant losses when they sell their loan. Again using a US$ 20 million illustrative loan. If the loan is distressed and buyers are offering say 65 then the seller will incur a US$ 7 million loss on the sale of the loan.

There are a variety of methods of transferring loans between institutions, the three most common being novation, assignment and sub-participation. Novation involves the original lender relinquishing its existing exposure and an entirely new loan being created with the new lender. Assignment involves the transfer of the loan to another bank. A sub-participation takes place when the existing lender remains the lender of record and the new lender takes over the credit risk. In addition to these three common methods of loan transfer, banks have become increasingly sophisticated at using insurance[9] and loan securitisation[10] methods to manage their loan exposure. There are a variety of complex legal issues, which need to be carefully

9. A lender may, for instance, cover its credit exposure to a particular borrower by purchasing an insurance policy that indemnifies the lender in the event that the borrower defaults under the loan agreement.

10. Securitisation is the process whereby a lender transfers a portfolio of loans to a special purpose vehicle. This vehicle is then rated and issues a variety of debt securities through the normal capital markets channels.

considered when seeking to transfer loans.[11] In addition, lenders will want to ensure that the capital, accounting and taxation treatments are acceptable.

The secondary market has taken on greater importance for project finance and banks increasingly use the secondary market to manage project finance loan exposures. It has become common for banks to sell whole portfolios of loans on the secondary market. We have seen earlier, however, that one of the reasons that commercial banks are important for project finance is that these institutions take a longer term approach to lending and value the relationships they have with project sponsors. Buying and selling exposures on the secondary market loosens these relationships. The sponsors and borrowers in project finance also expect lenders to make a long-term commitment to the projects they are financing. As a result, loan agreements include a range of restrictions on the ability of lenders to transfer their project finance loans. The exact nature of these restrictions is often the subject of significant negotiation during the documentation phase of a project financing. Lenders will usually insist, for instance, that their ability to trade loan exposures is unrestricted in certain circumstances (during an event of default, for example).

4.5 LOANS MARKET PRACTICE

Syndicated lending first became common in the 1960s and 1970s as a result of the increasing capacity of the international banking markets particularly in relation to interbank lending. Bank exposure to international loans, particularly those to governments in developing or newly independent countries, was found to be too large for individual institutions. At the same time the number of banks operating internationally was beginning to rise particularly in the major financial centres of New York and London. To diversify risks and offer large loans, banks started to form syndicates. In the early 1970s the development of the international loans markets accelerated dramatically due to the increase in oil prices and the associated US dollar surpluses earned by oil exporters. These exporters had few opportunities to invest in their domestic economies and hence these ‘petrodollars’ found their way into international commercial banks for investment in the syndicated loans markets. Although initial activities was focused on loans to sovereign states and large corporations, the market developed further in the 1980s and 1990s into a much wider range of activities, including project finance and mergers and acquisitions. The market is now highly sophisticated with non-bank lenders playing an increasingly active role and borrowers of all different types raising funds on the market.

4.5.1 Organisation of the Syndicated Loans Market

The organisation and management of a syndicate involves coordination of a variety of different institutions both to form the initial syndicate and to manage

11. For a more detailed commentary on the legal issues relevant to loan transfers and securitisation see Wood (1995).

the exposure once the loan has been signed. Market practice has developed over several decades and the larger commercial banks tend to organise their syndication activities around syndications teams or 'desks', which are staffed by experienced market players. During the loan syndication process one or a number of the arranging banks will be selected to act as 'bookrunner'. The bookrunner is responsible for organising bank syndications meeting (roadshows) and communicating with potential lenders during the general syndication process. The bookrunners will normally be responsible for the syndication strategy and, in particular, the participation and fee levels. Once a loan has been signed, the responsibility for managing the syndicate then moves to dedicated agency teams.

4.5.2 The Various Agency Functions

It would not be efficient for the borrower to engage individually with each of the members of the syndicate. This would be administratively cumbersome and inefficient. Instead, the bank group appoints one of the banks to act as their agent in dealing with the borrower. All communications and administration flows through the agent bank. The exact role, functions and responsibilities of the agent bank are defined by the terms of agency engagement.[12] For a syndicated loan, however, the most important functions include: administering the payments between the syndicate and the borrower, managing decision-making amongst the lending group, monitoring of the underlying loan contract, record keeping and so on. The agent is also responsible for fixing interest rates and for administering decisions of the bank group. The mechanics of decision-making can be complex and the detailed rules on bank group voting and timing of votes is detailed in the loan agreement.

In addition to the facility agent, there are a variety of other roles that are normally undertaken within the bank group. Lenders usually take security over a variety of project finance assets. The security interests are usually held by a security trustee, which is a lender appointed by the bank group to hold security on behalf of the lenders. Banks within the syndicate are also selected to act as account banks, usually an onshore account bank and an offshore account bank. Lenders may also be appointed to carry out other roles.

12. Agents are appointed pursuant to the terms of agency contracts, which, for the purposes of syndicated loans, are incorporated into the loan facility agreement. The terms of appointment of a facility agent for a syndicated loan are now largely standardised and incorporated into LMA documentation.

Part II

The Petroleum Industry – Commercial Risks and Contracts

It has been explained in Part I that project finance is based on the two fundamental concepts of lender risk analysis and forecast project cashflows. The notion of 'bankability' was also introduced together with the approach that lenders take when analysing project risks. We have also seen that the project finance markets cover a wide variety of industries from roads, railways and hospitals to petrochemicals plants and pipelines.

We will now start to focus on the specific features, characteristics and risks of the petroleum industry and, in particular, how these risks are managed through commercial and contractual arrangements between the different parties operating in the industry. The fundamental basis of a project finance transaction is the commercial structure of the project and, more specifically, the contracts which allocate project risks and underpin the project cashflows. The following chapters are thus primarily intended to provide an overview of the various contract structures and terms that are commonly encountered in oil and gas project finance transactions. In Part III we will then go on to cover the acceptability of industry risks and the bankability of commercial contracts to project finance lenders. It will be seen that many of the contractual arrangements found in the petroleum industry create challenges for project lenders. As a result, the structuring of a project financing in this industry can often require significant modification to contract terms to ensure that commercial structures are bankable.

A further aim of this part of the book is to illustrate the diversity of risks that the petroleum industry presents to lenders. Chapter 5 will set the context by looking into the various elements of the oil and gas industry value chain and examining the role played by each. The broad division of the industry into upstream, midstream and downstream activities will be explained and the defining features of each sector will be covered.

Chapters 6 to 11 will then look in more detail at various elements of the industry. Each chapter begins with an explanation of the fundamental features of the industry sector followed by a review of the most important risks that impact projects in the sector. The commercial and contractual structures that are commonly encountered to manage these risks, are then reviewed. It will be seen that projects in the different segments of the industry have unique characteristics and risk profiles. It is thus essential to understand the variability of project risks so that in Part III the way the financial structuring process for each industry sector can be understood.

Chapters 12 and 13 examine a number of important and specific risks that affect all projects in this industry. Most projects in the oil and gas industry are complex and involve the development of sophisticated industrial plant. The development and completion risks are therefore significant and Chapter 12 will examine the approach that the industry adopts to project development in order to manage the risks associated with cost, schedule and performance shortfalls. Furthermore, oil and gas projects are subject to significant political, environmental, tax and insurance risks. These risks can each have a significant influence on the performance of a project and are examined in Chapter 13.

Chapter 5

Fundamentals of the Petroleum Industry

Chapter Outline

5.1 INTRODUCTION

The risk profile and performance of projects in any particular industry are strongly influenced by the characteristics and trends found in that industry. The oil and gas industry is no exception. It is thus important to understand the main drivers of profitability in the petroleum industry and the trends that are taking place in the various relevant oil and gas markets. The aim of this chapter is to review the petroleum industry at a general level and describe some of the notable features of the industry.

Section 5.2 examines the basic purpose of the oil and gas industry by looking at the raw materials that the industry processes, and the products and markets which the industry serves. Ultimately the petroleum industry is about satisfying the world's demand for energy. It will be seen, however, that oil and gas provide the building blocks for many other important applications some of which have become essential to modern society.

Section 5.3 then goes on to explain the various elements of the petroleum industry value chain. It will be seen that although the upstream, midstream and downstream sectors of the industry are closely interrelated they possess different characteristics and features.

Section 5.4 covers the industry structure, markets and economics. The various types of organisation competing in the industry will be examined together with market trends and the importance of governments throughout all industry sectors.

5.2 THE BUSINESS OF PETROLEUM

The petroleum industry exists to supply a wide range of essential products to a variety of end-user markets. These products are manufactured from naturally occurring deposits of oil and gas. To operate efficiently and effectively the industry extracts, processes, stores and transports a huge variety of materials often over large distances and in hostile and challenging environments. Transforming these raw materials into useful products involves a highly complex and global industrial organisation, which is subject to a variety of environmental, political, legal and economic pressures.

The international petroleum industry in its current form has existed for around a century. Although petroleum products were first used for heating and lighting, it was only with the development of diesel, petrol and jet engines that demand for the industry's products began to accelerate. The growth of the industry largely mirrors the growth in the automotive industry and increased rapidly as vehicle usage grew, particularly in the decades following the end of WWII. The development of turbine technology also increased demand for other petroleum products such as jet fuel for the airline industry and natural gas for power generation. A remarkable increase in the supply of oil and gas also took place during this period. New sources of supply were found and developed all over the world particularly in the Middle East and North Africa.

Growth rates in the petroleum industry have now matured. Conservation and the search for alternative sources of fuel to satisfy the demand for energy have become key industry themes. Despite these lower rates of growth, the industry still satisfies over half of global energy demand and, given the projected increases in energy usage, petroleum products are likely to continue to be needed for at least the next few decades. The data presented in Table 5.1 is adapted from BP's Statistical Review of World Energy for June 2014.

TABLE 5.1 Global Energy Demand, 2014

	Tonnes of oil equivalent (millions)	Percentage share
Oil	4,185	32.9
Gas	3,020	23.7
Coal	3,827	30.1
Nuclear	563	4.4
Hydroelectricity	856	6.7
Renewables	279	2.2
Total	**12,730**	**100**

Source: Adapted from BP's Statistical Review of World Energy for June 2014.

According to BP, the world's demand for energy totalled around 12.7 billion tonnes of oil equivalent in 2013 of which oil and gas satisfied around 57%, the rest representing coal, nuclear, hydropower and renewable energy. The petroleum industry is therefore closely tied to developments taking place in the wider energy markets. The petroleum industry is not, however, just about fuels. Petrochemical products supply many essential materials into world markets, including plastics, fertilisers, fabrics, solvents, chemicals and synthetic rubbers. Other products include waxes, bitumen, dyes and lubricants. Understanding the characteristics and risks of the industry raw materials and product markets is essential given that the success of projects in this industry will ultimately be determined by these industry fundamentals. The following sections introduce these topics in more detail.

5.2.1 Raw Materials

Naturally occurring crude oil and gas extracted from underground reservoirs are the basic raw materials for the petroleum industry. These raw materials do not, however, exist in a single, homogenous state. Rather there are many types of oils and gases present in different locations and stored in a range of sizes and types of reservoir. The cost of extracting these raw materials varies depending on location and the characteristics of the reservoir and reservoir fluids. Furthermore, the economics of the extraction process is largely driven by geological factors, which often determine the ultimate performance of a particular project.

Crude Oil

Crude oil is categorised according to its density, the presence of impurities and its location. The density of crude oil is traditionally measured using the API gravity,[1] the lower the API gravity, the heavier the crude oil. A medium crude oil has a gravity of 20° to 30°. Density is indicative of the composition of the crude oil and the ease with which it can be processed. Lighter crudes are normally more valuable than heavier crudes as a greater volume of more useful lighter components can be produced with less processing cost. Crude oils contain many different types of impurities including toxic, corrosive and reactive substances that can be costly to deal with. One of the most important impurities is sulphur and crude oils are generally classified according to sulphur content as sweet or sour, sweet crudes typically containing less than 0.5% sulphur and sour crudes more than 2% sulphur. Higher sulphur crude oil requires costly treatment and hence sour crude oils are generally sold at a significant discount as compared to sweet crude oils.

In addition to API gravity and sulphur content, petroleum refining and processing requires many more physical and chemical properties and characteristics of crude oils. This information is typically supplied in the form of an 'assay'.

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1. The American Petroleum Institute, or 'API', created the API gravity as a method of measuring the density of petroleum liquids compared to water. The API gravity scale is measured in degrees. Water has an API gravity of 10°.

An assay is the product of extensive laboratory testing and provides a detailed physical and chemical analysis of a particular crude oil. This information is used to determine the suitability of crude oils for a particular refinery configuration and is important in determining the potential value of the crude oil.

Natural Gas

Like crude oil, natural gas is a mixture of hydrocarbons and is normally found in similar locations to oil. In fact crude oil and natural gas are often found together, in which case the gas is described as 'associated gas' (as opposed to 'non-associated gas' if no oil is present with the gas in the reservoir). The main component of natural gas is methane and the gas is described as 'wet' or 'dry' depending on the proportion of heavier components in the mixture. Wet gas contains appreciable volumes of liquid, which condenses out of the reservoir fluid at surface conditions (this fluid is called 'condensate'), and liquid petroleum gases (being propane and butane), which can be liquefied at normal temperatures. Dry gas contains very little condensable fluids.

The various by-product liquids, gases and impurities produced along-side crude oil and natural gas can have a considerable influence on value. Some of these by-products are themselves important raw materials for the petrochemicals industry and hence have significant value. These raw materials will be dealt with in more detail in Chapter 11. Condensate has a similar value to light crude oil and hence the economics of natural gas projects can be significantly enhanced if condensate is also produced. The presence of impurities in both natural gas and crude oil can also impact the costs of developing the resource and the value to end-users.

5.2.2 Petroleum Products

Petroleum products are broadly used either as fuels or non-fuels, the fuels market being by far the larger. Although the petroleum industry produces several hundred different types of product from crude oil, the main objective of a refinery has traditionally been to manufacture gasoline and diesel for the transportation sector. The market for natural gas has developed in parallel and growth in this market is largely based on the demand for gas for heating and power generation.

Oil Products

Crude oil is a complex mixture of molecules and no two crude oils are exactly the same. When processed through a refinery a wide range of products is produced. The output from a refinery after processing a particular type of crude is known as the 'product slate'. A typical product slate will normally include the following products.[2]

2. The purpose of this book is to provide only a general overview of the various petroleum products and hence the description contained herein is limited and simplified. For more detail on the composition, specifications and uses of petroleum products a variety of advanced industry textbooks are available. See, for instance, Lucas (2000).

- *Liquefied petroleum gas or LPG*: A mixture of propane and butane which can be liquefied by pressure at ambient temperature. LPG is used mainly as a fuel but can also be an important feedstock for the petrochemicals industry.
- *Gasoline and naphtha*: A complex mixture of different components primarily based on the low boiling point liquid fractions from a petroleum refinery. Gasoline is used as a transportation fuel. Naphtha is similarly based on low boiling point fractions but is not sold to gasoline specifications and rather is used primarily as a petrochemical feedstock.
- *Jet fuel and kerosene*: A mixture of higher boiling point petroleum fractions. Jet fuel is a high specification fuel used to power jet engines. Kerosene is used as a general-purpose fuel.
- *Diesel and heating oil*: Diesel is a higher boiling point fuel, which, like gasoline, is commonly used in the transportation sector and subject to strict controls over specification. Heating oil has composition similar to diesel but is burnt in boilers or furnaces for heating.
- *Fuel oil*: Typically refers to the heaviest fractions or residues of crude oil. There are a variety of fuel oils, which are used in power plants, ships engines (bunker fuel) and so on.

A refinery may also produce lubricating oils, waxes, bitumens and sulphur. To be marketable to end-users, each of the products from a refinery must conform to particular specifications. These specifications typically relate to performance, environmental impact, safety and handling.

Products From Natural Gas

The products from raw natural gas originate from gas-processing operations and include a range of materials that are similar to light products derived from refining crude oil.

- *Methane and ethane*: These are the simplest and lightest hydrocarbons and exist as gases with low boiling points. Methane and ethane are both used as fuels. Ethane is also used in large quantities as a petrochemical feedstock.
- *LPG*: LPG has been covered above.
- *Condensate*: Raw gas often contains appreciable volumes of heavier hydrocarbons that condense when produced from the reservoir. These heavier components are collectively called condensate and are similar in many respects to refinery-produced naphtha.
- *Other*: Raw natural gas usually contains a variety of other components, including sulphur and valuable inert gases (helium, neon, argon, etc.).

The products from natural gas are required to meet certain specifications depending on the end-use. Product specifications and the quality of produced raw gas can together have a strong influence on the economics of gas projects and therefore need to be fully understood when considering the viability of specific projects.

5.3 THE INDUSTRY VALUE CHAIN

The petroleum industry value chain is the linked series of distinct but inter-related activities that transform crude oil and natural gas into valuable end-user products. These activities are broadly organised into three main sectors, namely upstream, midstream and downstream. Although the elements of the value chain cannot exist in isolation, each has its own characteristics and features. The economics, risks, commercial structures and technologies of each sector are distinct and it is this feature of the industry that accounts for the variations in project finance structures throughout the value chain. A further characteristic of the petroleum industry value chain is that it can extend beyond national boundaries and hence the industry is geographically diverse with the raw materials often located far from consumers. This international dimension adds particular importance to the infrastructure and logistics required to handle the volumes of international trade. Furthermore, the demand–and-supply characteristics of the industry are dynamic. Relatively small changes in supply and demand can have a fundamental impact on the architecture of the value chain.

5.3.1 The Upstream Industry

The upstream industry is concerned with finding and extracting the raw materials that feed through into the other elements of the industry. Crude oil and natural gas are usually found deep under the surface of the earth often in hostile and remote locations. Finding and extracting these resources thus requires significant capital investment. An important concept in the upstream industry is the 'field life cycle', which describes the evolution of an upstream project over time. Oil and gas reserves firstly need to be found and then, once developed, will be produced from a depleting resource base. Although the specific characteristics of any field can vary significantly from other fields (even in the same province), most fields follow the same basic life cycle. The most significant risks in the upstream sector of the industry include geological risk, political risk, economic risk and environmental risk. These will be examined in more detail in the next chapter.

Crude Oil Reserves and Production

Although crude oil reserves and production are distributed relatively widely throughout the world, the Middle East is the dominant region with a 47% share of total reserves as illustrated further in Table 5.2.

The total global production of oil in 2013 was 86.7 million barrels per day, the largest producing countries being Saudi Arabia, Russia and the United States. The share of production by region is led by the Middle East with a total of 28.4 million barrels per day, followed by Europe and Eurasia with 17.2 million barrels per day and then North America with 16.8 million barrels per day. The total proved reserves of crude oil were 1.7 trillion barrels in 2013 with Venezuela, Saudi Arabia and Canada having the largest reserves.

TABLE 5.2 **Crude Oil Reserves and Production**

Production	Barrels per day (thousand)	Reserves	Barrels (billion)
Saudi Arabia	11,525	Venezuela	298.3
Russia	10,788	Saudi Arabia	265.9
United States	10,003	Canada	174.3
China	4,180	Iran	157.0
Canada	3,948	Iraq	150.0
UAE	3,646	Kuwait	101.5
Iran	3,558	UAE	97.8
Other	39,106	Other	434.1
Total	**86,754**		**1,678.9**

Source: Adapted from BP World Statistical Review 2014.

Natural Gas Reserves and Production

The natural gas reserves and production are also spread widely but the distribution by region and country are quite different compared to crude oil. The country distributions of natural gas are illustrated in Table 5.3.

Total production in 2013 was 3,370 billion cubic metres. The largest producing countries were United States, Russia and Iran. Total proved reserves were 185 trillion cubic metres with Iran, Russia and Qatar having the largest shares.

TABLE 5.3 **Natural Gas Reserves and Production**

Production	Cubic metres (billion)	Reserves	Cubic metres (trillion)
United States	687.6	Iran	33.8
Russian Federation	604.8	Russian Federation	31.3
Iran	166.6	Qatar	24.7
Qatar	158.5	Turkmenistan	17.5
Canada	154.8	United States	9.3
China	117.1	Saudi Arabia	8.2
Norway	108.7	UAE	6.1
Other	1,371.8	Other	54.8
Total	**3,369.9**		**185.7**

Source: Adapted from BP World Statistical Review 2014.

Regionally the Middle East accounted for approximately 43% of gas reserves and Europe 31%.

5.3.2 Midstream Industry

Petroleum from underground reservoirs is very rarely suitable for any form of end-use. Once extracted the raw materials need to be transported for further processing and then the final products moved to the end consumer. There are situations where the raw materials are processed as soon as they are extracted and then moved a short distance to the end market. Invariably, however, the industry supply chain involves transportation over long distances, often crossing borders and over the world's oceans. A vast and complex logistics structure is therefore an essential element of the international petroleum industry

Pipelines and Storage Facilities

Pipeline and storage infrastructure is an essential element of the oil and gas industry supply chain. To deliver raw materials for processing and final products to market a vast and complex system of pipelines and storage tanks is required. The ongoing development and maintenance of this supply system requires enormous investment and the financing requirements are considerable. Infrastructure investment is closely related to changes in supply and demand. Pipelines and storage capacity must be able to handle the throughputs required to meet instantaneous levels of demand. If there is insufficient capacity then bottlenecks will occur in the system and demand will be unsatisfied. If, however, there is too much capacity, parts of the system will be redundant resulting in inefficiency and high cost. Judging the capacity requirements for pipelines and storage infrastructure is therefore a critical function in the industry and incorrect decisions can threaten the viability of projects in all sectors of the industry value chain.

There are many different types of pipeline and storage facilities, each of which is designed to handle different materials in different conditions and for different purposes. Whether, for instance, infrastructure is being designed to handle liquids or gases will have a significant impact on designs and costs. The risks associated with oil and gas infrastructure also depend to a great extent on specific conditions. Low temperature, high pressure, deep sea, mountainous and earthquake-prone locations all impact the risks associated with pipeline development and operation.

Both pipelines and storage tanks involve significant capital investment and once installed the high investment requirements can create barriers to competition. The owners of pipeline and storage infrastructure can thus act monopolistically. As a result, this sector of the oil and gas industry value chain is typically subject to strict anti-trust regulation to reduce the likelihood of monopolistic behaviour. Governments impose price regulation on the pipeline and storage industries and restrict the ability of operators to freely determine the prices and tariffs, which they charge for capacity. Governments also seek to ensure that pipeline and storage infrastructure is freely available. Third party access rights are, therefore, a feature of many regulatory regimes. The implications of regulation in the midstream oil and gas industry will be explored in more detail in Section 8.3.3.

Shipping and Offshore Interface

The sea borne transportation of crude oil and refined products using ships and tankers has been a vital part of the oil and gas industry since the earliest days. In many situations ships and tankers are the only viable options for transporting the industry's raw materials and products. It would be hardly plausible, for instance, to contemplate delivering crude oil from Saudi Arabia to Japan by pipeline. Although a central activity in the industry, petroleum shipping has its own special features, laws, characteristics and terminology, much of which have been inherited from the wider shipping industry rather than the petroleum industry. It is thus debateable whether petroleum shipping should be studied as part of the global shipping industry or the oil and gas industry.

Shipping provides transportation services to all sectors of the petroleum industry. Ships are able to handle all types of crude oil, natural gas (including LNG), LPG, refined products and petrochemicals. The shipping fleet is enormously varied, ranging from large crude carriers to small chemical carriers. The maritime interface also extends into offshore service vessels (seismic vessels, installation vessels, drilling ships and the like) and floating infrastructure (floating production storage and offloading vessels and so on). The petroleum shipping and offshore sector is thus a highly varied and sophisticated industry in its own right and often requires special treatment when considered as part of a project finance transaction.

5.3.3 Downstream Industry

The downstream industry is concerned with the conversion of crude oil and natural gas into valuable finished products for sale to final consumers. Without processing, crude oil and natural gas have limited value and the downstream industry thus employs a variety of physical and chemical processes to transform these raw materials into final products. The industry is capital-intensive and highly competitive and hence downstream economics are characterised by low margins, high volumes and technological advantage to improve efficiencies. The majority of the products of the petroleum industry have been traditionally sold as fuels for heating and powering engines and turbines for transport and electricity generation. Gasoline, diesel, jet fuel and natural gas are the ubiquitous products of this industry. The downstream processes of petroleum refining and gas processing are therefore targeted towards the production of fuels. In processing raw materials into fuels, however, a vast array of by-products are produced and one of the great achievements of the industry has been to apply ever more sophisticated technical solutions to add value to every molecule present in the original crude oil and natural gas.

Crude Oil Refining and Natural Gas Processing

Petroleum refinery is a large scale, energy-intensive industrial process, which takes crude oil as a raw material and, through the deployment of a variety of processing steps, produces a range of petroleum products. Traditionally refineries have been located in consuming countries and crude imported to the refineries on large crude carriers or by pipeline. The organisation of the industry is, however, experiencing significant change. An important trend is the investment in refining capacity at the source of crude with petroleum product being exported.

Although the basic function of a refinery is to separate crude oil into various light and heavy components, there are many different types of refinery and no two refineries are exactly the same. This reflects the type of crude oil which the refinery is designed to process and the demand for specific products in particular markets. Refining is characterised as a high volume and low margin business and this has important implications for project finance. When looking at refinery project finance lenders tend to focus on the sustainability of the refinery cashflows and, given that this is a function of the technical capability of the refinery, it is essential for lenders to refinery projects to understand the linkage between technology and economics in the refinery industry.

The aim of natural gas processing is to produce pipeline quality gas, which can be delivered to end-users. Like petroleum refining, natural gas processing results in the production of a variety of by-products, which are also used as fuels or form the production of petrochemicals. The value of these by-products can be significant from an economic perspective and much of the petrochemical development in the Middle East has been based on by-product raw materials from natural gas processing.

Petrochemicals

The petrochemicals industry has evolved out of oil and gas processing by adding value to low value by-products, which have limited use in the fuels industry. The industry now produces a remarkable range of useful products, including plastics, synthetic rubber, solvents, fertilisers, pharmaceuticals, additives, explosives and adhesives. These materials have important applications in almost all areas of modern society. Petrochemical products are used in cars, packaging, household goods, medical equipment, paints, clothing and building material to name just a few of the common applications. Furthermore, the industry continues to innovate through new technology and the ability to process different types of raw materials.

The petrochemicals industry sources raw materials from refining and gas-processing and converts these raw materials into valuable products using a variety of chemical process technologies. A variety of feedstocks are used as raw materials, the industry driver being economic. If cheap feedstock is available then there will always be somebody who is prepared to try to make a profit by making something valuable out of it. These feedstocks are subject to a variety of processes with the aim of producing a hand-full of chemical building blocks. These building blocks are further processed through a variety of reactions to form the final petrochemical products.

The target markets for petrochemical products are smaller and more specialised in comparison to refined products and natural gas. Although petrochemical products usually earn premium prices compared to refined products and natural gas product, marketing is more demanding. Market risks and competitive analysis therefore play an important role in lender assessment of petrochemical project finance transactions.

5.4 INDUSTRY STRUCTURE, MARKETS AND ECONOMICS

Analysis of the structure of the petroleum industry involves examining the competitive forces that shape the industry and how profits are distributed amongst the various actors that operate in the industry. In general, relationships between various entities in any particular market are determined by the level of industry competition. In perfectly competitive markets there are many actors, none of whom are able to influence market prices. In contrast, in a monopolistic market, a single actor dominates supply and can control prices through its own actions. The petroleum industry demonstrates a variety of different market types depending on which particular segment is being considered and the location of particular markets. Commodity markets are often considered to be perfectly competitive and this is the case for many globally traded crude oil and petroleum products. The market for crude oil is, however, also influenced to a considerable degree by the largest producers. The Organisation of the Petroleum Export Countries or 'OPEC'[3] is an international organisation whose aim is to coordinate the petroleum policies of its members. The OPEC members together control around a third of global oil production and the production decisions made by OPEC members have a considerable bearing on the supply of crude oil into the global markets. OPEC thus acts in a classical oligopolistic fashion and has on a number of occasions successfully exerted considerable control over the global crude oil markets. Midstream infrastructure, especially pipelines, can create monopolies. As a result, whether the economics of a particular project are driven by competitive, oligopolistic or monopolistic factors, it depends largely on the particular sector of the industry and the specific market characteristics.

3. OPEC was established in 1960 and its current members are: Algeria, Angola, Ecuador, Iran, Iraq, Kuwait, Nigeria, Qatar, Saudi Arabia, United Arab Emirates and Venezuela. OPEC members have traditionally coordinated their activities through a system of crude oil production quotas, which set maximum production levels for each member country.

5.4.1 The Industry Competitive Environment

A wide range of organisations competes in the petroleum industry. Although many of these are private companies a significant proportion of the industry is state owned. The largest companies operate in all the sectors of the industry value chain and in all parts of the world. Others operate in one area of the value chain and possibly in one region or country. Governments also exert a significant influence on the industry's competitive environment and in many parts of the world local organisations are protected in their home markets. The role of government will be explored in more detail in Section 5.4.3.

- *Integrated oil companies*. The most familiar organisations in the oil and gas industry are the so-called 'Majors'[4] or 'International Oil Companies' namely: BP, Chevron, ExxonMobil, Shell, and Total. Each of these companies has a long history in the industry with Shell, ExxonMobil and Chevron being early pioneers in the early development of the international oil and gas markets. The Majors are vertically integrated operating in all sectors of the industry and, although they continue to exert significant influence on the industry, their relative standing has declined as the importance of state-owned companies has increased.
- *National oil companies*. Companies that are majority owned by a government are commonly termed 'National Oil Company' or NOC. The NOCs now represent some of the most influential organisations in the industry, particularly through their involvement in OPEC. The largest NOCs include Saudi Aramco, Kuwait Petroleum, Abu Dhabi National Oil Company (ADNOC), Petroleo Brasileiro (Petrobras), Nigerian National Petroleum Corporation (NNPC) and Statoil.
- *Other large companies*. Other large companies that are often as large as the IOCs and NOCs but which are usually not categorised in these groups include several of the Russian oil and gas companies (Gazprom, Rosneft and LUKoil), the Chinese companies (Sinopec, CNPC and PetroChina) and other large independent firms (ENI and so on).
- *Independents*. At the other end of the scale, there are many smaller companies, which specialise in particular areas of the industry value chain. Examples include small and medium sized exploration and production companies (usually termed 'independents'), independent refiners, pipeline and storage operators and so on. These smaller independent companies often work in joint ventures with the IOCs and NOCs.

There are, furthermore, a range of other organisations involved in the oil and gas industry, including utility companies (particularly in the gas and infrastructure sectors), chemicals companies and service companies. Many of the largest

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4. The Majors as they currently exist are largely the product of a wave of mergers, which took place in the early 2000s. Since then the term 'Supermajor' has also been used, although the collective name 'Majors' is also still commonly used.

chemical companies are, for instance, heavily involved in petrochemicals manufacturing and refining. These companies include: Dow Chemical, BASF, SABIC, Ineos and so on.

Competition between all of these various organisations is severe throughout the industry value chain. Many sectors of the industry are mature and growth rates are relatively modest, as a result, organisations have to work hard to maintain market share let alone expand. This feature of the industry has important implications for project economics as lenders will scrutinise the project viability, especially in mature sectors. Despite its apparent maturity, however, the industry has continuously innovated. In the upstream industry, seismic technology, sub-sea production systems, horizontal drilling and hydraulic fracturing technologies have continued to advance and open up new reserves. In the midstream industry, pipelines have been installed in more difficult environments including deep water and arctic conditions. The development and improvement of processes, materials and technologies in refining and petrochemicals has continuously improved efficiency and enabled the industry to react to changes in product supply and demand. Technological innovation, the drive to increase reserves and the need to protect market share have also resulted in considerable mergers and acquisition activity in all areas of the petroleum industry.

5.4.2 Market Characteristics and Trends

It is difficult to characterise the global market for petroleum due to the wide range of different products produced by the industry and the fact that petroleum product sales are spread across so many different regional markets. Each product and regional market has its own distinctive characteristics, which influence the supply, demand and ultimately prices for each category of petroleum product. The refined products' markets, for instance, are subject to varying levels of government price controls. In mature markets, refined products tend to be heavily taxed whereas in emerging markets subsidies for many products are common. Gas prices also vary significantly between regions largely due to supply restrictions resulting in more constrained movements between regions and hence less uniform global pricing. Historically, for instance, there have been significant and sustained price differentials between the North American, European and Asian regional gas markets.

The markets for crude oil, refined products and natural gas are also impacted to a significant extent by weather and climatic conditions. Seasonal variations in the demand are pronounced in many markets and usually have a strong influence on prices in particular markets. Particularly unexpected variations in seasonal weather cause prices in a various product markets to vary dramatically.

Despite these regional and seasonal differences in petroleum markets, factors can be identified which influence the global demand, supply and pricing of petroleum products. Ultimately the demand for the industry's products is principally derived from the demand for energy. The increasing size of the world's population and generally rising living standard suggests that demand for energy and hence oil and gas will continue to grow. In contrast, efficiency improvements, increasing environmental constraints and competition from alternative technologies could result in significantly reduced demand for petroleum products generally. Forecasting the future direction of demand trends in the petroleum industry is therefore a challenging exercise. Some argue that the petroleum industry is mature and that society is on the verge of a period of energy transition whereby innovation in technology results in dramatic changes in the demand for contemporary sources of energy. The historical change from wood to coal and then to oil is projected forwards assuming that petroleum fuels will ultimately be displaced by sustainable fuels and technologies. Clearly changes of this magnitude will have a fundamental impact on long-term investment in oil and gas projects.

Turning to supply trends, throughout the history of the industry, new sources of supply have been successfully found and exploited and, more importantly, new technologies have been developed enabling access to otherwise uneconomic resources. The recent dramatic growth in unconventional oil and gas production in North America has had a profound influence on the balance of supply of both oil and gas in the world markets. Despite these technical successes, however, non-technical considerations can also have a significant impact on oil and gas supply. Political factors have had a particularly strong influence on petroleum supply, not least through the actions of OPEC members.

Overall, therefore, the markets for petroleum industry products are characterised by very high levels of uncertainty and, as a result, accurately forecasting demand and supply trends, particularly over the medium and long term, is virtually impossible. But we have already seen that forecasting is an essential element of the investment decision-making process and hence the challenges, that confront decision makers in the petroleum industry, should be obvious. Without a reduction in the levels of uncertainty, funding costs for oil and gas projects could increase significantly or, in the worst case, shortages of long-term capital could severely constrain the ability of the industry to fund essential projects and maintain production levels.

5.4.3 Government Influence

National governments influence all industries to some extent, especially through taxation, regulation and broader economic policies. For a number of reasons, however, the oil and gas industry is particularly impacted by government actions. The direct ownership by governments of major players in the oil and gas industry has already been noted and there are many other areas where governments are directly and indirectly involved in the industry. As a result, the petroleum industry value chain cannot be properly understood without considering government influence. Governments take a particular interest in the oil and gas industry for a number of nationally important reasons. Firstly, oil and gas resources are usually valuable national assets whose development can often transform an economy. In most jurisdictions governments own the underlying resource and, through a variety of licensing arrangements, allow private companies to develop these resources (see Section 6.4.1). Secondly, governments recognise that the financial contribution from the upstream oil and gas industry is usually significant and hence special fiscal regimes are used to maximise the financial benefit to governments. Thirdly, the supply of petroleum products is usually strategically important for industrial production, military security and general well being of the population. Security of petroleum supply is hence a major government concern.

One of the most important areas of government influence is through tax and fiscal policies for the petroleum industry. Special tax regimes are usually imposed on the upstream industry and the rules regarding tax are invariably extremely complex. Given that tax has a direct influence on project cashflows, government tax policies often have an impact on the risk profile, commercial and financial structuring of projects. Tax and fiscal policies can also impact the midstream and downstream industry. An area, which often has an influence on the refining industry, for instance, is the tax and subsidy regime for petroleum products. Given the importance of tax on projects in this industry a fuller examination of this topic is included in Section 13.4.

In addition to the national interest drivers, governments also exert significant control over petroleum industry operations through laws and regulation, many of which can be intrusive to projects in the industry. The legal and regulatory framework in particular jurisdictions can have a fundamental impact on project finance. The resulting risks to projects are examined further in Section 13.2.2.

5.4.4 Economics of the Petroleum Industry

Although value and profitability in the industry are ultimately determined by the interaction of supply and demand, other factors also have a strong influence on industry economics. Government policies can, for instance, have a significant impact on prices and costs. Governments often control prices and also influence production costs through tax and fiscal systems. The following sections will review some of the most important economic factors' impact on the viability of oil and gas projects.

Industry Revenues

The price of oil and its volatility is a defining characteristics of the oil and gas industry. Although the industry produces a vast range of different products, the income which the industry generates is largely determined by the price of oil. The prices of petroleum products from refineries and petrochemical plants are highly correlated to the price of crude oil. Natural gas prices, whilst highly variable between different regions, are likewise strongly influenced by crude oil prices. The size of industry revenues can be simply approximated by looking at total production of oil and gas and applying an average price. We have seen that the total consumption of oil and gas is equivalent to around 7.2 billion tonnes of oil equivalent. If an average product price of around US$ 500 per tonne[5] is assumed then total industry revenues are approximately US$ 3,600 billion per year. It can be readily seen from this that small variations in the average industry price will result in very large changes in overall revenues.

Although the overall income earned by the industry is extremely large, the share of revenues within the different sectors of the industry is highly variable. The refining industry, for instance, operates on the basis of very large production volumes and very slim margins. Assuming an average refinery margin of US$ 30 per tonne, compared to product prices of US$ 500 per tonne, the share of refining is relatively modest. Likewise, natural gas is typically priced at a significant discount to crude oil and hence its share of industry revenues is also relatively small compared to oil. The petrochemical industry is based on higher product prices but, given that the production volumes are significantly lower, its share of revenues is comparatively small. The majority of industry income is therefore still earned by the upstream oil sector although it is this part of the industry which has the most rapid depletion rates (and hence requires the most significant ongoing investment) and the highest share of government take.

Industry Capital, Operating Costs and Taxes

Another distinguishing feature of the oil and gas industry is its high capital intensity. Developing oil and gas reserves, transporting and processing products to market and storing huge volumes of valuable product all cost significant sums. High levels of investment are required in the upstream sector just to maintain the existing production levels of a depleting resource. The range of investment required in the upstream industry is also extremely wide. The cost of developing a medium-sized oil field can vary by a factor of ten or more depending on location and reservoir conditions. A well drilled in a benign environment, from an onshore conventional reservoir and close to existing infrastructure will obviously yield significantly cheaper oil compared to a well drilled in a harsh remote offshore environment from an unconventional reservoir.

Although the midstream and downstream sectors likewise require substantial capital investment, the assets depreciate over much longer timescales (40, 50 or even more years in some cases). In addition the costs are much more predictable. This characteristic of the industry value chain is one of the reasons why financing structures vary so much in the industry.

5. One tonne of crude oil is equivalent to approximately 7.33 barrels based on average density. A crude oil price of US$ 68 per barrel is therefore equivalent to approximately US$ 500 per tonne. See www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy/using-the-review/Conversionfactors.html

Costs associated with the environment, health and safety have become increasingly significant to the industry overall. Activities in all elements of the industry value chain have a significant impact on the environment. The costs to society of environmental impacts are generally considered in economic terms to be 'negative externalities' meaning that they are costs that are generally not borne by those creating them. Governments have, however, increasingly internalised the environmental costs of the industry through regulation, environmental taxes and penalties for causing environmental damage. Government influence on the economics of the global industry through the tax system is also significant. Through taxes, governments take a large share of industry value, especially in the upstream sector of the industry. Tax will be covered in more detail in Section 13.4.

Chapter 6

Upstream Oil and Gas

Chapter Outline

6.1 INTRODUCTION

Upstream oil and gas projects are exposed to some of the most demanding risks in the industry and, as a result, upstream project finance can present significant challenges to project financiers. The unpredictability of the earth's geology, the volatility of oil prices and political interference in the industry are difficult for lenders to accept.

Section 6.2 starts by looking at the nature of the upstream oil and gas industry. This business is concerned with production of both oil and gas from underground reservoirs and shares characteristics with other extractive industries. While reserves and price risks tend to dominate the analysis of these types of projects, environmental impact has become one of the most influential factors in determining project success.

Section 6.3 then goes on to describe the major risks faced by companies operating in the upstream industry. The focus is on the risks associated with geology, the sub-surface environment, commodity prices, environmental impact, political interference and cost escalation.

Section 6.4 examines some of the more important commercial arrangements that the industry has adopted to manage upstream business risks and, in particular, the underlying mineral rights that enable project sponsors to access and produce the underlying resources.

6.2 FUNDAMENTALS OF UPSTREAM OIL AND GAS

The field life cycle is a fundamental concept in the upstream industry and forms the basis for understanding the risks and economic characteristics of upstream projects. The field life cycle starts with exploration and then moves through appraisal, development, production and finally into abandonment. The time taken to move through the field life cycle is highly variable and depends on the specific characteristics of the project. Many projects fail to move out of the exploration and appraisal phase. High cost projects may, for instance, be unviable without increased oil prices. Other projects may be delayed due to legal or political reasons.

6.2.1 Exploration and Appraisal

The exploration phase is the first stage of the field life cycle and involves searching for oil and gas using a variety of sophisticated techniques. Seismic surveys are undertaken and exploration wells drilled in prospective areas. Exploration is subject to considerable uncertainty and the chances of success are relatively low. In general approximately one in five wells result in some form of discovery and, given that a single exploration well can cost considerably in excess of US$ 20 million, it should be apparent that exploration is a high-risk activity. If an exploration well results in a discovery, the next stage is to appraise the resource. This involves obtaining additional data and potentially drilling new wells. Development options are then evaluated and, if a viable project emerges, activities will be more into the next phase.

During the exploration and appraisal phase of a project there is little certainty that income will be earned to recover the investments made. For this reason debt finance is rarely an option for funding exploration and appraisal activities and this phase of the field life cycle is seldom, if ever, suitable for project financing.

6.2.2 Development, Production and Abandonment

If the development of a discovered resource is viable then a field development plan (FDP) is prepared, which will usually include detailed information on geology, reservoir engineering, production engineering, well design and drilling programmes, surface facilities, environmental impact and mitigation, project risks and project economics. The FDP forms the basis for detailed project design and implementation and is an important element of government approval processes for upstream projects. The complexity of the development plan is influenced by the location of the project and the nature of the reserves. Offshore project development is, for instance, usually significantly more complex compared to onshore and the deeper the water the more complex the development. Likewise, developments in harsh conditions (arctic, earthquake prone, mountainous, hurricane prone and so on) create additional challenges. Unconventional sub-surface conditions also strongly influence development complexity, including high pressure and high temperature reservoirs, tight reservoirs, toxic or corrosive fluids.

Decisions made during the development phase will determine how a project is managed and performs during the production phase. The drilling programme will, for instance, determine how quickly production grows and the maximum or plateau production rate. The size of the surface facilities will also determine the capacity of the system to handle maximum production rates. At some point field production will decline at which stage the project sponsors will usually try to extend the life of the field through enhanced production techniques, additional drilling and so on. Throughout the production period the reservoir and production wells will require careful ongoing management and monitoring.

Eventually, however, once the costs of production exceed the revenues generated by the project, the sponsors will abandon the field. At this juncture most governments impose decommissioning obligations on the field licence holders. The costs of decommissioning can be significant and provisions will usually be made to finance these costs either through cash reserves or contingent financial guarantees.

6.3 UPSTREAM PROJECT RISKS

Upstream projects in the oil and gas industry are faced with a wide range of complex and demanding risks. Geological risks can cause production to decline rapidly, governments can nationalise projects or change licence terms, design errors can lead to cost overruns and delays. And most important of all, oil prices change on a daily basis and can drain project cashflows literally overnight.

6.3.1 Geological and Reserves Risk

Petroleum reserves usually exist deep under the Earth's surface in sedimentary rocks that vary considerably in composition and physical properties. The only way to access these reserves is to penetrate the rocks with wells drilled from the surface. Although wells provide vital information about the reservoir and its fluids they only penetrate a very small volume of the rocks. Estimating the volume and nature of the petroleum in these sub-surface accumulations is thus extremely difficult requiring specialist skills. But reserves form the basis of production estimates which ultimately determine project economics. It is therefore essential to understand the nature of the risks associated with reserves estimation and the methods that are commonly employed to deal with these reserves risks.

Nature of Reserves Risks

Certain very specific conditions need to exist for oil and gas to be formed. Under the right conditions petroleum is produced in source rocks from which the fluids migrate. If impermeable rocks trap the migrating fluids then potentially producible reserves exist. In addition to being physically present in reservoir rocks, to be considered reserves, the petroleum fluids must also be economically recoverable. The decision to invest in the recovery of oil and gas from identified accumulations is based on the estimation of the recoverable reserves based on data that is collected using specialist techniques. The information available in the early stages of a project is usually limited and may be restricted to geophysical properties, such as seismic data, and pre-development data gathered from a small number of exploration and appraisal wells that have penetrated the reservoir. During the early stages of a project, the limited extent of information available on the reservoir means that the reserves estimates are subject to high levels of uncertainty. As the project is developed, and especially once production begins, more information on the reservoir fluids and rocks becomes available and the level of uncertainty reduces. The unfortunate fact of reserves estimation is, however, that complete certainty on the extent of recoverable reserves is only possible once all the fluids have been produced.

Managing Reserves Risks

To help manage the uncertainty associated with reserves estimation a variety of classification systems have been developed. The aim of these systems is to establish a set of criteria that can be used to determine the reliability of a particular estimation of reserves. The most widely used system has been developed by The Society of Petroleum Engineers/World Petroleum Congress (SPE/WPC) and is known as the Petroleum Resource Management System (PRMS).[1] The PRMS provides a classification framework which is based on certain defined recoverable resource classes, namely production, reserves, contingent resources and prospective resources. These classes are distinguished by the relative degree of uncertainty in the development and commercial production of the underlying resource base. The reserves classification is further sub-divided into proved and unproved reserves and, following on, the unproved reserves into probable and possible reserves. The PRMS defines proved reserves as follows:

> *Proved reserves are those quantities of petroleum, which, by analysis of geoscience and engineering data, can be estimated with reasonable certainty to be commercially recoverable, from a given date forward, from known reservoirs and*

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1. The latest complete version of the PRMS was published in 2007 and is sponsored by the Society of Petroleum Engineers, the American Association of Petroleum Geologists, the World Petroleum Council and the Society of Petroleum Evaluation Engineers. See:www.spe.org/industry/docs/Petroleum_Resources_Management_System_2007.pdf. In addition to PRMS, other important classification systems include those developed by the US's Securities and Exchange Commission (SEC), the Russian Federation classification scheme and the United Nations Framework Classification for Energy and Minerals Resources.

under defined economic conditions, operating methods, and government regulations. If deterministic methods are used, the term reasonable certainty is intended to express a high degree of confidence that the quantities will be recovered. If probabilistic methods are used, there should be at least a 90% probability that the quantities actually recovered will equal or exceed the estimate.

In general, to be categorised as proved reserves, there must be a high degree of confidence that the volumes will be recovered, which translates on a probabilistic basis to at least a 90% chance that the quantities recovered will equal or exceed the estimate. To achieve these high levels of certainty, a significant amount of sub-surface data will typically be required from wells which have penetrated the reservoir and reliable production data. The PRMS further categorises proved reserves as developed or undeveloped and defines developed reserves as those that can be produced from existing wells and facilities. Unproved (probable and possible) reserves are defined as those reserves that are based on similar data as used in the estimates of proved reserves. The level of uncertainty in this data, however, precludes these reserves from being classified as proved.

To illustrate the use of these concepts, assume that it is estimated with 90% confidence that a reservoir will produce at least 50 million barrels of oil, with 50% confidence at least 150 million barrels will be produced and with 10% confidence 300 million will be produced. In this case proved reserves are 50 million barrels, probable reserves are 100 million barrels (150 less 50) and possible reserves are 150 million barrels (300 less 150).

A variety of different terms are used to describe these different reserves categories. Proven reserves are often referred to as P90 (or 1P) estimates, proved plus probable as P50 (or 2P) and proved plus probable plus possible as P10 (or 3P). Project sponsors often base investment decisions and development plans on P50 reserves and associated production profiles. Traditionally, however, project lenders have been reluctant to extent credit to reserves other than those categorised as P90, developed and producing. This difference between lender risk appetite and sponsor development plans can create some difficulties in the structuring and negotiation of project finance transactions, particularly if project lenders refuse to accept more aggressive development plans or insist on P50 cost estimates being applied to P90 production forecasts. The approach lenders take generally to geological and reserves risks is examined further in Section 18.2.1.

6.3.2 Sales and Market Risks

The revenues from the sale of oil and gas products ultimately generate the cashflows to service debt and provide a return to investors. The risks associated with the sale of a project's production can generally be thought of in terms of sales volume risk and sales price risk. Volume risks are associated with the size of the end-market for the particular product whereas the product price is determined by the interaction of supply and demand in the market place.

Volume Risks and Size of the Market

Sales volume risk associated with upstream projects is mainly related to markets for crude oil and natural gas. Although other products such as LPG and condensate are sold into their own markets and can generate significant revenue for particular projects, the markets for these products are generally strongly influenced by the global oil and gas markets. There are, however, notable differences between the markets for crude oil and natural gas markets. While the markets for crude oil are large and sophisticated, in contrast natural gas markets are regionalised and less well connected at a global level. Inaccessibility to markets for natural gas projects can mean that large discovered resources remain undeveloped for many years. Accessing the most attractive markets for natural gas is thus one of the most important considerations in the development of a natural gas project. This will be dealt with in greater depth in Section 10.2.4.

Given the size and sophistication of the global oil markets, volume risks for projects selling crude oil are considered to be relatively low. For specific projects this may not, however, always be true. Access to infrastructure, particularly export pipelines, can act as a constraint on the sale of crude oil volumes. In addition, crude oil specifications can be important in determining the ease of selling particular crudes in the global markets.

Price Risk

Crude oil is one of the most widely traded global commodities and its price is set by a complex system at the centre of which are a number of important benchmark prices. These benchmarks provide a link between the spot market, futures markets and contract prices. The most important benchmarks for crude oil include Brent Blend[2] and West Texas Intermediate.[3] The prices of these benchmarks are derived on an almost continuous basis from actual physical crude oil trades and transactions in the futures markets and should, in theory, reflect the supply and demand in the oil markets. Prices are, however, also influenced by speculative trading and, as a result, the benchmark prices can be highly volatile. There have been many periods in the past when the price of oil has increased or decreased by large amounts over short periods of time. In 2008, for instance, the price fell from US$ 150 per barrel down to US$ 39 per barrel in the space of a few months. Although rising back up to over US$ 110 per barrel by 2014, the price of Brent has since collapsed back to below US$ 30 per barrel. The industry is thus currently experiencing one of the most challenging economic

2. Brent Blend is a classification of crude oil which originally referred to production from the Brent oilfield in the UK sector of the North Sea. The term is now used to describe a blend of crude oil from several field including Fortes, Oseberg and Ekofisk. Brent Blend is used as a benchmark for physical and paper price quotations and is quoted as a future price on the Intercontinental Exchange in London.

3. West Texas Intermediate or WTI refers to a particular blend of crude oil that is traded at Cushing, Oklahoma and is used as a price reference point for future contracts traded on the New York Mercantile Exchange.

environments and the impact of price risk on project viability has become the principle concern of investors and lenders in this industry.

The prices of particular grades and blends of crude are generally set by applying premiums or discounts to agreed benchmarket prices. These premiums and discounts are intended to make provision for differences between particular crude oils and the relevant benchmarks and typically adjust for quality (which impacts processing costs and product slate) and location (which impacts logistics costs). Selecting the most appropriate benchmark prices and the applicable premium or discount is of fundamental importance in ensuring that a particular crude oil is correctly valued.

The industry has developed a variety of techniques to manage the risks related to the volatility of oil and gas prices. A range of financial contracts now exists which enable the risks of price movements to be mitigated to a significant extent. Commodity price derivative contracts can, for instance, fix the price of a commodity over a period of time. These derivative contracts take the form of future, forward and option contracts and have become increasingly sophisticated. Risk management and derivative contracts are covered further in Section 18.5.

6.3.3 Project Development Risks

Project development risks in the petroleum industry are addressed further in Chapter 12. Project development in the upstream sector of the industry does, however, have certain unique features. The complexity of upstream projects can vary considerably ranging from relatively straightforward onshore projects involving a few production wells tied back to existing infrastructure through to demanding offshore projects in deep water, hostile environments and far from existing infrastructure. Design concepts and decisions often have to be made using limited production data and within the context of a significant geological uncertainty. Furthermore, development activities, particularly drilling, often continue throughout the life of the project. In addition, the size and complexity of upstream project development usually means that projects cannot be developed on the basis of single lump-sum contracts. Rather project sponsors typically enter into multiple contracts with specialist contractors. For these reasons upstream project development risks are often difficult to accommodate in project finance transactions without significant levels of contingent support.

6.3.4 Upstream Environmental Risks

Activities in the upstream oil and gas industry present potentially serious threats to the environment. The industry is responsible for a number of well-known catastrophic incidents which have demonstrated how harmful the industry can be to the environment. As a result, oil and gas activities are subject to significant scrutiny by various organisations and environmental due diligence for projects in this sector is critically important. Furthermore, it is important to understand that environmental damage caused by projects can cause serious reputational harm not only to the project sponsors but also to other parties, including lenders and contractors. Reputational damage is usually the result of serious adverse publicity, criticism and censure by non-governmental organisations, public protests and government intervention. The damage caused manifests itself through harm to corporate brands and potential significant loss of value. Lenders are acutely aware of these risks and will thus expect projects to achieve the highest possible standards of environmental compliance (see Section 15.4.5).

6.3.5 Country Risks, Political Risks and Government Influence

Governments typically take great interest in the upstream oil and gas industry. Most economies would cease to function properly without access to refined products and natural gas and the performance of the upstream oil and gas industry is thus of national interest to most governments. Petroleum reserves are a source of considerable national wealth and through regulation, ownership and taxation, governments attempt to ensure that these national resources are properly managed to yield the maximum benefit to society. The extraction of petroleum resources can also have considerable impact on economic performance, both beneficial and harmful.

Governments usually exert influence on upstream oil and gas projects in the following ways:

- *State ownership*: In most countries the ownership of minerals and mineral rights are nationalised. Private sector involvement in the development of mineral resources is usually accomplished through licensing regimes or contractual arrangements both of which are examined in more detail in Section 6.4.1. The nature of private sector involvement in a host country's petroleum industry varies considerably as does the method of granting rights to explore for and exploit petroleum reserves. In many countries a state-owned national petroleum company is mandated to manage the granting of rights to private sector enterprises. In addition, these national companies often retain significant ownership interests in petroleum projects through joint venture arrangements with private sector participants.
- *Project development*: Governments usually retain significant control over the development and operation of oil and gas projects. The regulatory regime typically includes mandatory approval and reporting requirements such as: government approval of development plans, government permitting for specific activities such as flaring, water disposal and so on and environmental, health and safety regulations.
- *Taxation*: The upstream industry is usually subject to special taxation arrangements. These will be examined in further detail later in Section 13.4. The challenge faced by the industry, however, is that upstream tax systems

and regimes have a tendency to change over time, sometimes dramatically. The taxation of mineral resources in general is a politically sensitive subject, which adds a further dimension to upstream project risks.

Country and political risks are typically difficult to assess and quantify. It is, for instance, very difficult to assess the potential cashflow impact of a change in government. Likewise, it is equally difficult to decide how much additional return is needed because a project is being developed in a country were the administrative regime is under-developed and decision-making may slow up the project approval process.

6.4 COMMERCIAL STRUCTURES AND UPSTREAM CONTRACTS

A number of unique commercial arrangements are commonly found in the upstream oil and gas sector which are designed to manage the complex and varied risks in the industry. Upstream commercial and contractual arrangements determine how and by whom risks are managed together with the cost of transferring the risks to contract counterparties. Although there are many different types of contracts, to bring a degree of standardisation, a variety of model contracts have been developed. The major oil companies often require their own in-house model form contracts to be used by contract counterparties. In addition various bodies have produced standard form contracts. The Association of International Petroleum Negotiators (AIPN),[4] for instance, has developed a variety of contract forms for the industry.[5] The most significant provisions of the more important upstream contracts for project finance are summarised in the following sections.

6.4.1 Mineral Rights

The arrangements concerning the ownership of the underlying mineral resource usually form the basis for any upstream project financing. Without effective ownership rights over the underlying petroleum resources, the project sponsors will find it extremely difficult to raise third-party finance and will be unable to offer satisfactory security interests to project finance lenders. Although the legal position regarding the ownership of mineral resources is complex and varies between jurisdictions, it is almost invariably the case that petroleum rights are retained by national governments. There are two major ways in which government mineral rights are commonly granted to project developers. The

4. The AIPN is a membership association formed in 1981 to support negotiators in the energy industry.

5. Contract forms available for: Gas Sales Agreement, Gas Transportation Agreement, Joint Operating Agreement, LNG Master Sales Agreement, Service Contracts, Unitisation and Unit Operating Agreement.

state either provides developers with concessions or licences to undertake activities or enters into contractual arrangement that stipulate how ownership of petroleum production will be allocated between the various parties. The latter contractual arrangement is called a 'production sharing agreement'. In some jurisdictions (the United States and Canada, for instance) oil and gas resources are often privately owned and rights to licence agreements are granted by the landowner directly.

Concessionary Systems and Licensing

The concept of a concession is that one party (usually a government but the term also applies to private entities) has monopoly rights (including but not limited to rights of ownership) over some resource or activity. This party then allows another party (the concessionaire) to enjoy certain specific rights over the resource or activity by entering into some form of concession contract or licence. Concessions and licences will thus stipulate in detail the particular rights and obligations of the parties. In the oil and gas industry, governments typically retain all rights to explore and exploit petroleum resources and allow oil and gas companies to undertake various activities through petroleum licensing arrangements. The exact licensing regime varies between jurisdictions although there are common features that are found in most licensing systems. The system for administering the award of licences typically involves a series of licensing rounds whereby the rights to explore for, develop and produce from particular geographical areas, or 'blocks', are awarded to bidders. Different types of licence are normally awarded for particular classes of activity. Thus governments usually issue separate licences for exploration and production. Exploration licences may not, for instance, allow the licence holders to drill wells. The licence regime will also usually include specific provisions governing the tax and fiscal regime applicable to the particular project.

Production Sharing Agreements

Production-sharing agreements are contractual arrangements between host governments and companies whereby the host government agrees to allow an oil company to explore for and develop petroleum resources. The oil company provides the capital required to develop the resource and in return receives a set proportion of the production. The basic philosophy of a production-sharing agreement is based on the notion that the host government retains ownership of the petroleum resource and agrees with a contractor to exploit that resource in return for the contractor earning a share of production. In addition to the sharing mechanism, production-sharing agreements also include a variety of other terms, the more important of which are summarised as follows.

- *Grant of rights*: The contractor is granted the right to undertake petroleum operations within a defined geographical area.

- *Term and termination*: The term of a PSA is typically divided into two phases, namely an exploration phase and a development phase. The development phase usually lasts for a period of 20–25 years from start-up.
- *Exploration, appraisal and development*: The contractor is typically obliged to conduct minimum exploration work and, in the event of discoveries, carry out appropriate appraisal work. Development plans will need to be approved by the relevant authority.
- *Disposal of petroleum*: Although PSAs often allow the contractor complete freedom in disposing of its share of production, there may be constraints. In some contracts the contractor may be obliged to sell production to a state-owned buyer on specified (and often restrictive) terms.
- *Work programmes, budget, etc.*: The PSA will usually impose minimum work obligations on the contractor. The state will also typically retain rights to approve budgets and expenditure eligible for cost recovery.
- *Cost recovery and production sharing*: The methods for recovering cost and sharing production are explained further below.
- *Royalties and taxation*: In addition to profit sharing, PSAs may also include royalty and tax provisions. Royalties are typically paid out of gross revenues before cost recovery. Taxes are usually paid after cost recovery.
- *Stabilisation clauses*: These are clauses that attempt to contractually bind the government party to the terms of the agreement and protect the contracting parties from changes in law or other government actions which change the economic basis of the agreement.[6]
- *Local content, technology transfer, etc.*: The government will often impose obligations on the contractor to use local contractors, hire local employees and transfer technology.
- *Ownership of assets*: The state often retains ownership of all project assets. This can create challenges for project finance given that lenders usually seek to take security interests in the project assets.

The most important economic terms of the agreement concern the valuation of production, recovery of costs and sharing of production. In essence, following the payment of any royalties to the government, the contractor recovers its capital and operating costs through the value of petroleum production (commonly termed 'cost oil'). Once the contractor has recovered its costs it will share the remaining production (commonly termed 'profit oil') with the government in a pre-agreed proportion. This sharing of production is illustrated in Figure 6.1.

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6. Stabilisation clauses are common in many private contracts between investors and governments and are often seen as an essential element of political risk mitigation by project finance lenders. The enforceability of stabilisation clauses is however questionable. In addition, the use of these clauses has been the subject of public criticism (see 'Stabilisation Clauses and Human Rights', a research project conducted for IFC and the United Nations Special Representative of the Secretary-General on Business and Human Rights, May 2009).

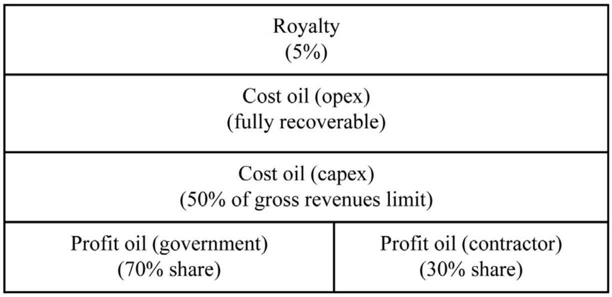

FIGURE 6.1 Illustrative production sharing mechanism.

If it is assumed, on a per barrel basis, that a project generates US$ 100 of revenues, spends US$ 20 on operating costs and has significant unrecovered capital costs from previous periods then the government will firstly take US$ 5 in royalty payments. Next, the contractor will deduct US$ 20 of operating costs and the maximum US$ 50 limit of capital costs. The remaining US$ 25 will then be split – US$ 7.5 to the contractor and US$ 17.5 to the government. Overall, therefore, the contractor will take US$ 77.5 of the total revenues and the government US$ 22.5. The government may also tax the contractor's share of profit oil, which would obviously reduce the contractor's overall take and increase that of the government.

Although the basic concept of a PSA is relatively straightforward, the exact proportions and methods of sharing are often complex. The sharing proportions may change according to various criteria, including the volume of production, returns earned by the contractor and so on. The rules concerning the eligibility and methods of cost recovery can also be complex and project specific. The government or its representatives will, for instance, normally expect to audit and approve annual cost recoveries. It is also important to realise that production is shared on the basis of value rather than volume and hence changes in the commodity prices will normally impact the volume of oil attributable to the contractor. Higher oil prices equate to a lower share of production to the contractor and vice versa. As a result, reserves estimates may be impacted by variations in oil prices through the sharing mechanism.

Unitisation Agreements

Unitisation is concerned with the development of fields which cross licence boundaries. Licence boundaries do not necessarily conform to the boundaries of the sub-surface formation. If a field crosses one or more boundaries then, without unitisation, each block owner will independently develop that part of the field in their respective block.[7] Developing a field on this basis is often

7. The legal principle at work in this situation is known as the 'Rule of Capture', which defines ownership rights based on the person extracting the underlying petroleum resources.

inefficient and can damage the reservoir, reduce recovery rates and increase costs. The goal of unitisation is to ensure that different block owners sharing a common accumulation develop the field as a single unit. Licence holders sharing a common field will enter into a unitisation agreement, which will firstly establish the percentage interests in the unit. Each licence holder's interest will be based on the area of the unit, which falls within its respective licence area. This area is known as a 'tract' and the percentage interests in the unit are based on 'tract participations'. The unit interests and tract participations are often updated as more information on the reservoir becomes available through a process known as 'redetermination'. The unit holders will then appoint a unit operator and establish a unit operating committee.

In many ways unitisation agreements are similar to joint operating agreements (JOA) and include many similar provisions, including the ability of unit participants to undertake sole risk activities and the treatment of non-unit operations within the relevant licence areas. Unitisation agreements can be difficult and complex to negotiate, particularly if there is sensitivity to sharing of commercially valuable information and disagreements between participants on the interpretation of data. The provisions of unitisation agreements are usually fundamental to the economic performance of a project and hence lenders often take a significant interest in the terms of these agreements. It is essential, therefore, that the provisions of unitisation agreements are acceptable to lenders and their advisors.

Service Contracts

A service contract is signed between a government and an oil company pursuant to which the oil company is obliged to explore for and/or develop petroleum resources in exchange for a pre-determined service fee. The main reason for adopting service contracts is to allow states to continue to retain the maximum level of control and ownership over natural resources whilst at the same time engaging contractors to develop those resources. These contracts have been adopted by governments where sovereign control over petroleum resources is a sensitive political issue. Oil companies have been obliged to enter into service contracts in jurisdictions such as Iran and Venezuela. In contrast to concessionary, licence and production sharing systems, service contract systems do not pass ownership interests in the oil and gas resource to the contractor and hence the contractor is not able to recognise reserves as part of its service contract activity. The lack of reserves base can mean that service contract arrangements are difficult for lenders to accept as a basis for project finance loans.

6.4.2 Corporate Structures and Joint Venture Arrangements

Many different types of corporate structure are used to organise activities in the upstream oil and gas industry and various factors will need to be considered when deciding on the most appropriate corporate structure to adopt. Tax and accounting considerations, local regulatory requirements, financing structures and corporate policy will all need to be taken into account.

The upstream industry has traditionally been organised through joint ventures largely to diversify risks, particularly in the early exploration and appraisal phase of a project. Although the exact composition of a joint venture consortium depends on many factors, there are a number of notable industry characteristics, which affect corporate structure. Due to the high costs of upstream project development, smaller exploration companies often look to bring in larger companies with greater access to capital. In addition, as part of national petroleum policies, governments often require local partner representation in oil and gas joint ventures. Many corporate structures therefore include small explorers, major oil companies and local partners.

Unincorporated Joint Ventures

We have already seen that project finance has traditionally been based on funding a project using a special purpose incorporated company. Upstream oil and gas projects tend to be based on joint venture arrangements whereby the holders of the rights to the mineral resource do not establish an incorporated company to hold the interest but work together on an unincorporated basis. In contrast to an incorporated joint venture no separate entity is established to manage the joint venture. Given that parties are generally free to agree whatever contract terms they want, an unincorporated joint venture is a highly flexible arrangement. There are, in addition, tax and accounting benefits as well as cost and administrative advantages given that many of the usual requirements for incorporated companies are not necessary.

Unincorporated joint ventures do, however, create some challenges. The partners to the joint venture must be careful to avoid the arrangement being classified as a partnership. A partnership will usually result in less advantageous tax treatment. In addition, for project finance, unincorporated joint ventures are a move away from the traditional single purpose entity concept. There is no single borrower and the assets, rights and obligations of the joint venture are divided between the partners. These issues are not insurmountable and project finance has been used to fund unincorporated join venture projects. The resulting financial structures do, however, become more complex.

A common feature of many upstream oil and gas joint ventures is the carrying of one party's obligations by other parties in the joint ventures. These arrangements are commonly called 'carried interests'. As an example, assume a joint venture consists of two parties, A and B. A has 70% interest and B has 30%. Assume that B has limited funds but has an important stake in the venture (due to it representing the government, for instance). A has agreed to carry B's share of the project's costs until first production. B's interest is therefore carried and A will pay 100% of the costs of the project. A will then be reimbursed (usually with interest) through B's share of production.

Joint Operating Agreements

Upstream oil industry unincorporated joint ventures are almost invariably governed by the terms of a JOA. A JOA controls the relationship between the parties to the joint venture and sets out the arrangements for managing the joint venture activities. Although the joint venture participants are largely free to negotiate whatever contractual terms they desire, JOA terms have become relatively standardised. There are, in addition, various model form contracts, which provide a basis for detailed negotiation. Typical JOA terms include the following.

- *Participating interests*: The proportional interest of each joint venture participant will be specified in the JOA.
- *Operator*: An operator is appointed to manage the joint venture. The nominated operator is often the partner with the largest interest in the joint venture.
- *Control of operations*: The non-operators usually control operations through decision-making mechanisms and a variety of operating committees. The agreement usually stipulates tendering procedures for major project contracts, accounting provisions and audit rights.
- *Programmes, budgets and cash calls*: Annual work programmes and budgets are usually agreed between the joint venture partners and implemented by the operator. The operator will make cash call for programme expenditure.
- *Rights to petroleum*: The agreement defines the rights of the joint venture partners to their share in production. Detailed provisions are usually incorporated regarding lifting schedules and the consequences of failure to lift.
- *Sole risk*: Certain activities may not be supported by all the joint venture parties. Sole risk provisions allow one or a number of the joint venture parties to undertake work themselves and at their own risk.
- *Assignment and transfer*: The assignment and transfer provisions usually include rules, which limit the ability of joint venture parties to transfer their interests. A common provision is the right of non-transferring parties to preempt any proposed transfers.
- *Defaults and remedies*: The default provisions of a JOA are often complex and are largely concerned with the failure of one of the parties to honour its cash call obligations. In this case the other parties will typically cover the shortfall and the defaulting party will forfeit its rights under the JOA. Ultimately the defaulting party could lose its interest altogether in the joint venture.
- *Decommissioning*: The JOA may also include detailed terms covering the parties' obligations to fund decommissioning costs. A separate abandonment or decommissioning agreement may be required which stipulates the various mechanisms for agreeing and managing decommissioning and abandonment activities.

JOAs represent an essential part of most upstream oil and gas project financing structures. The terms of a JOA need to be flexible enough to cope with the wide variety of activities required to manage a field through its full life cycle. The detailed provisions of these agreements can, however, significantly alter the risk allocation between the various contracting parties and in many cases can create challenges in allowing lenders to control the development and operation of a particular project.

6.4.3 Upstream Sales Arrangements

Crude oil and natural gas are sold pursuant to sales contracts between the producer and a variety of different buyers, including refiners, traders and speculators. This section will focus on the sales arrangements for crude oil and other unrefined upstream products. Natural gas sales contracts have certain unique characteristics and will be covered in Section 10.4.2. Crude oil is bought and sold on wholesale markets pursuant to contracts based on relatively standardised terms. The various types of petroleum product which are the subject of these agreements have particular characteristics and are sold into different markets. As a result, the types of commercial and contractual sales arrangements encountered in the upstream industry are quite varied. The following summarise the more important terms of sale.

- *Quality*: The quality of the product being sold is determined by reference to standard industry specifications, including density, sulphur content and so on. The buyer is usually given rights to inspect at the delivery point.
- *Quantity*: The sales quantity is usually expressed in barrels or tonnes and the contract will make allowances for losses.
- *Price*: Sales contract prices are usually determined by reference to a benchmark with adjustments including: cost of delivery, product specifications, taxes and so on.
- *Payment and security*: Sellers typically require payment security in the form of bank guarantees or letters of credit.
- *Delivery, title and risk*: Crude oil may either be delivered onto a vessel named by the buyer or delivered by the seller to a specified loading point. Incoterms[8] are widely used to define delivery obligations.

In many upstream project finance transactions the sponsors often lift themselves their share of production from the project and hence the sales arrangements will be made between the project company and the sponsors. If sales are

8. Incoterms, or the International Commercial Terms, are a set of trade terms published by the International Chamber of Commerce, which define the responsibilities of buyers and sellers pursuant to contracts for the sale of goods. The current version of Incoterms was published in 2010 and defines eleven terms based broadly on the place of delivery and responsibility for payment of carriage, insurance, duties and other specified expenses. Commonly used Incoterms include Free-on-Board ('FOB' which broadly allocates shipping responsibility to the buyer), Cost, Insurance and Freight ('CIF' which broadly involves the seller paying for transportation costs) and Delivered-at-Place ('DAP' which broadly allocates shipping responsibility to the seller). For the full listing of terms and definitions refer to www.iccwbo.org/products-and-services/trade-facilitation/incoterms-2010/the-incoterms-rules/.

made to third parties, the practice of entering into cargo-by-cargo or short-term sales contracts can present challenges for project finance. Lenders typically expect long-term sales contracts to support debt service. Given the depth and liquidity of the global crude oil markets, however, lenders may accept shorter-term sales arrangements but rarely for less than a year. The lenders will, however, stipulate minimum contract requirements particularly regarding the type of buyer and the terms of payment security.

6.4.4 Construction and Development Contracts

Developing upstream oil and gas projects is a complex project management task requiring the coordination of multiple activities. Offshore project development adds a further level of complexity to this project management task. A number of the larger offshore oil and gas projects are the most complicated development projects ever undertaken. A variety of specialist contractors, suppliers, fabricators and service companies are typically involved in the development of oil and gas projects. The activities involved in drilling, testing and completing appraisal and development wells in themselves involve a multitude of different parties. In addition, sub-sea systems, floating production facilities, oil and gas processing equipment and export pipelines are each major sub-component projects within the overall project development concept. It is very rare in the upstream industry for projects to be developed with a single fixed price contract. The general issues surrounding project development in the petroleum industry will be discussed in more detail in Chapter 12.

6.4.5 Other Commercial Arrangements

In addition to the aforementioned broad categories of commercial arrangements for upstream projects, a variety of other arrangements and contracts can be encountered in the upstream sector. The type of arrangements in place depends on the underlying philosophy for the project and, in particular, the availability of in-house resourcing. Given the size and complexity of most upstream oil and gas projects, project sponsors will usually need to procure a variety of different services, technologies and materials from third party contractors. The types and materiality of these contracts will depend on the specific features of a particular project.

Chapter 7

Petroleum Refining

Chapter Outline

7.1 INTRODUCTION

Crude oil in its natural state at the wellhead has limited value. A series of complex and expensive industrial processing steps are needed to convert crude oil into useful products. Combined together these processing steps constitute a petroleum refinery. The purpose of this chapter is to look in more detail at the refining of crude oil and, in particular, the industry risks that are relevant to project finance.

Section 7.2 will explain the way the industry is organised and the basic processes used to produce saleable petroleum products. Crude oil is a complex mixture made of many thousands of different molecules and processing crude oil produces a range of different products. An important aim of refining is therefore to reduce the volume of low value products and ensure that as much value can be created from the remaining marketable production.

Section 7.3 will then look at refining industry risks. The refinery business is characterised by volatile cashflows arising out of continuous changes in the price differencial between crude oil feedstock and refined products. Other risks include environmental risks, project completion risk, operating risk, political risks and macroeconomic risks.

Section 7.4 goes on to describe the commercial and contractual arrangements, which are commonly encountered in the refining industry. Many refineries operate as merchant plants whereby crude oil and refined products are bought and sold on a short-term variable price basis. Alternatively a refinery may be tolled by a third-party processor.

7.2 THE FUNDAMENTALS OF PETROLEUM REFINING

The business of refining is concerned with the conversion of high volumes of crude oil into a wide range of useful and valuable products. In contrast to the upstream oil and gas industry, which earns income from the sale of crude oil and raw natural gas, refiners earn income by generating a margin on each barrel of oil processed. This margin represents the difference between the purchase price of crude oil and the sales price of refined products. The impact on the refining industry of changes in the price of crude oil is, however, often misunderstood. The purchase of crude oil represents the most significant cost of refining and thus lower crude oil prices should benefit refinery projects through lower production costs (in contrast, lower crude oil prices mean reduced revenues for upstream projects). In actual fact, the economics of refining is significantly more complicated due to the complex relationship between crude oil and refined product prices. Although refinery margins are correlated to crude oil prices, the relative movements in product and oil prices can vary significantly at any point in time. As a result refiners are as concerned with the markets for refined products as they are with the crude oil markets. In comparison to crude oil, refined product markets are influenced by a range of different factors and the skill of the refiner is to match the output of their refinery[1] with the demand for particular products whilst minimising the costs of purchasing and processing crude oil. The wide variety of different crude oils that can be purchased, the technology options for converting crude oil into products and the volatility of product and crude prices contribute to a challenging business environment for petroleum refiners.

7.2.1 Transforming Crude Oil into Refined Products

The transformation of crude oil into useful products is a complex and energy intensive industrial operation which utilises various large-scale physical and chemical processes. These processes are integrated together to form a complete

1. The output, or product slate, of a particular refinery depends on the characteristics of the crude oil being processed and the technical configuration of the refinery.

industrial system that also includes storage facilities (crude oil, intermediate and final products), utilities, environmental treatment processes and import and export infrastructure. The processing steps required for any particular refinery are driven by the quality of the crude oil that is being processed and the required specifications of the products being produced. Every refinery is different and it is essential for project finance lenders to understand the basic characteristics of the refinery project that they are being asked to finance.

Crude Oil and Refined Products

There is no standard type of crude oil and specifications vary significantly between types and grades. To further complicate matters, it is virtually impossible to determine precisely the chemical species and molecules that are present in an individual crude oil. It is, however, important for refiners to understand the basic characteristics of a particular crude oil. This not only determines whether a refiner is technically able to process a crude but also the price the refiner is prepared to pay for its feedstock. The industry uses standardised procedures to determine the specifications of crude oils and refined products.[2] For the petroleum refiner, the most important description of crude oil is the assay, which contains physical and chemical information that ultimately determine the economic performance of a particular refinery.

Equally important to a refiner as the crude oil being processed are the products that will ultimately be produced. Refined product specifications are tightly defined for each particular use. For fuels, for instance, the end-consumer is concerned with issues such as burning quality, compatibility with engine and furnace technology, safety and so on. Almost as important as the specifications for use, however, are the quality specifications imposed by national regulators. These specifications are largely concerned with environmental protection and vary considerably between regions. Historically changes in environmental specifications have had dramatic impacts on the business of refining (the phasing out of lead in petrol, for instance, required significant investment in refinery process technology).

Refinery Processes and the Importance of Configuration

The arrangement of the various processing units which together form a refinery is known as the ‘configuration’. The configuration of a particular refinery is fundamentally important as it determines the types of crude oil which the refinery can process, the product slate and the product specifications. Refinery configuration thus has a strong influence on the profitability of a refinery and the ability of the refinery to sell product into its target markets. Although changing the configuration of a refinery can involve significant capital expenditure, refinery

2. Two of the most important standard setting organisations for the petroleum industry are the American Petroleum Institute (API) and ASTM International. See: www.americanpetroleuminstitute.com and www.astm.org

configurations have tended to evolve over time in response to changes in crude oil and refined product markets.

Refinery processes broadly fall into one of the three categories, namely (1) processes for separating materials, (2) processes for altering the sizes or shapes of molecules and (3) processes for the removal of components, particularly impurities. Each of these processes is performed using a variety of techniques many of which utilise proprietary technologies. The most important physical process in a refinery is crude oil distillation, which involves heating the crude oil in order to boil-off the lighter components.[3] Any un-distilled components are contained in a heavy refinery stream called atmospheric residue, the volume of which depends on the particular type of crude oil that is being processed. The heavier the crude, the more atmospheric residue will be produced. Some of this residue may be further distilled at lower pressure in a vacuum distillation unit, otherwise it is sold as lower value product.

The refinery processes other than distillation are primarily concerned with upgrading the various streams coming from the distillation units into final on-specification product for sale to the end-consumer. The following is a brief explanation of the most important chemical processes starting with those that handle the lighter refinery streams[4]:

- *Alkylation*: The aim of this process is to produce a gasoline-blending component from various refinery gases.
- *Reforming*: This process is also aimed at producing gasoline components but from low octane liquid fractions of crude oil rather than gases.
- *Isomerisation*: In the context of petroleum refining, the principle aim of isomerisation is to increase the octane rating of gasoline range fractions by changing molecular shapes.
- *Thermal, catalytic and hydrocracking*: The various refinery cracking processes aim to produce lighter products from the heavier components of crude oil by reducing the size of molecules.
- *Coking*: Coking is primarily intended to eliminate the production of fuel oil in the refinery. This is achieved by exposing heavy crude oil fractions to high temperature over long periods of time. This treatment produces coke and a variety of lighter components.

Although all refineries differ in terms of configuration, it is common to classify refinery configurations based on the ability of the refinery to upgrade the heavier components of crude oil. The greater the upgrading capacity, the higher the complexity of the configuration. To simplify terminology refineries broadly fall into three categories, namely simple, complex and deep conversion.

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3. Refinery size is normally measured in terms of distillation capacity. Smaller scale refineries distil around 50,000 bbls/day of crude oil while the largest refineries can handle almost 1,000,000 bbls/day.
4. For more detailed information on refinery processes see Gary et al. (2007).

A simple refinery has minimum upgrading capacity and hence the product slate broadly reflects the original composition of the crude oil feedstock. The various fractions from the distillation column are further treated but mainly to reduce sulphur content through treatment with hydrogen. Simple refineries are thus also known as 'hydroskimmers'. A complex refinery introduces a variety of upgrading processes primarily aimed at converting higher boiling point hydrocarbons to lighter products, particularly gasoline and diesel. This is mainly achieved through the distillation of atmospheric residue at reduced pressure followed by the cracking of the heavier molecules into lower boiling components. Finally a deep conversion refinery aims for zero residue production by eliminating all the higher boiling point components.

A more sophisticated refinery classification system was developed in the 1960s by W.L. Nelson and is known as the Nelson Complexity Index (NCI). This index is based on the relative cost of refinery units and, for any particular refinery, gives an indication of the refinery sophistication. The higher the proportion of complex upgrading equipment in a refinery compared to the crude distillation capacity, the higher will be the Nelson Complexity Index. A crude oil distillation unit has an NCI of 1.0. The most complex refineries have an NCI of over 10 and up to 14 or 15. The least complex refineries have an NCI typically of around 5.0.

Refinery configuration and complexity are important for project finance transactions as it is the upgrading capacity of a refinery that determines the ability of the refinery to earn satisfactory margins. Simple refineries have been known to experience long periods of negative operating margins, which presents significant risks to project finance cashflows. Project finance lenders and their advisors are aware of the importance of configuration on refinery economics and can be expected to approach financing for less complex refineries with great caution.

By-products and Environmental Impact

The composition of crude oil is such that in practice it is impossible to avoid producing significant volumes of by-products alongside the desired gasoline, diesel and jet fuel products. The industry has been able to find valuable uses for many of these secondary products including, for instance, lubricating oils, bitumen and asphalt, LPGs, waxes, petrochemical naphtha and coke. There are, however, certain by-product streams for which there are no valuable uses. These waste products include sulphur contaminants, carbon dioxide, contaminated water, volatile organic compounds, each of which can have a potentially damaging impact on the environment through air emissions, water pollution, ground contamination. Furthermore, environmental damage can be caused by the refinery operations themselves including leakage from storage tanks, flue gas emissions and industrial accidents. Finally, the use of petroleum products as fuels in engines and furnaces results in further harmful emissions through exhaust pipes, stacks and so on. Refining is therefore tightly regulated and controlled resulting in high compliance costs. The environmental impact assessment of refinery development and operations is an important aspect of due diligence in project finance transactions.

7.2.2 Product Markets and Industry Characteristics

The petroleum refinery industry is large and mature, the first refinery having started operations over 150 years ago. The industry grew rapidly in the 1950s and 1960s as car ownership dramatically increased and, although now mature, taken together today's markets for the various products derived from crude oil are vast and include materials that have become essential for modern society. The majority of refined products are sold as transportation fuels, primarily as a convenient source of energy for petrol, diesel, jet and marine engines. Gasoline, diesel, jet fuel and heating oils represent around 70% of the total refined products market.

Product Markets

Although the refined products markets in total are comparable in size to the global crude oil market, these markets are much more fragmented. Each geographical region has its own demand and supply characteristics and governments impose their own national specifications and regulations on refined products. Taxation and price controls impact markets in different ways and have a significant influence on demand and supply. Some countries subsidise petroleum products whereas others levy significant taxes on the consumption of these products, particularly transportation fuels.[5] The demand and supply characteristics for the various refined products also differ. The demand for lighter products used for transportation fuels is relatively inelastic, at least in the short term. There are few substitutes for many of these fuels. Demand for heavier fuels is, however, more elastic. Fuel oils have historically been used by utility companies to generate power. If the price of fuel oil increases then historically power generators have switched to lower cost fuels and the demand for fuel oil has dropped.

Total demand for refined product is around 90 million barrels per day or 4.4 billion tonnes per year. This is supplied by around 650 refineries giving an average refinery size of 140,000 bbls/day. In fact the largest refinery complex in the world is capable of producing almost 1 million barrels of refined product per day. The smallest refineries are less than 50,000 bbls/day. The geographical distribution of the market for refined products is presented in Table 7.1.

In general, the overall growth rates for refined products have slowed to around the general world GDP growth rates. Within the different product groups, however, growth rates have shown significant variation. In Europe, for instance, the rates of growth of diesel consumption have increased dramatically compared to gasoline. This is a result of technological developments with diesel engines and has had a dramatic impact on refineries and the trade in refined products in Europe.

5. It is well known, for instance, that tax represents over 70% of the price of retail petrol in United Kingdom. Variations in the wholesale price of crude oil thus often have only a marginal impact on forecourt petrol prices.

TABLE 7.1 Geographical Segmentation of Refined Products

	Million tonnes per annum	Market share
North America	1,024	24.5%
Central and South America	311	7.4%
Europe and Eurasia	879	21.0%
Middle East and Africa	556	13.3%
Asia Pacific	1,415	33.8%
Total	**4,185**	**100.0%**

Source: Adapted from BP World Statistical Review 2014

Demand for refined products has increased most dramatically in the emerging markets and, whilst there have been negligible increases in refinery capacity in the developed world, large capacity expansion and new refinery investment has taken place in the Middle East, Asia and Latin America.

Industry Characteristics

Although there are many different types of organisation now operating in the refining industry, the large international oil companies have traditionally dominated the refined product markets through their vertically integrated business models. This traditional industry structure has, however, changed dramatically over the past few decades with entry into the market by national oil companies and independents. The IOCs have also been selling (or even closing) their less competitive refineries allowing new entrants to enter the refined products markets. A number of significant independent refiners now exist, particularly in the United States and Europe. The refining business is highly competitive and capacity currently exceeds demand. The average refinery utilisation rates have historically been less than 90%. To survive in this industry, therefore, a refinery needs to be able to generate profits through competitive advantage. The most important determinants of refineries' competitive position include: size in terms of crude oil processing capacity, technical configuration, location and access to markets and ability to integrate with other operations including, for instance, petrochemicals. A domestic refinery may also be protected to a certain extent by protectionist policies of the host government and other barriers to entry.

7.3 REFINERY PROJECT RISKS

Refining of crude oil is a high volume and technically complex operation involving the processing and storage of hazardous and environmentally unfriendly materials. Hence like the upstream sector, refining is a high-risk activity. In comparison to upstream oil and gas projects, however, refineries have little direct exposure to sub-surface and geological risks. Refining is concerned with crude oil processing, the economics of which is determined by the ability of a refinery to efficiently process low-cost crude oil into higher value refined products. Market, economic and technical risks thus take on a much greater level of significance in the petroleum-refining sector.

7.3.1 Market Risks, Refinery Margins and Refinery Economics

The most important measure of refinery profitability is the gross refinery margin or 'GRM'. A refinery's GRM is calculated by deducting the cost of delivered crude oil feedstock from the income earned on the sale of refined products. The sales price of the refinery's production is calculated after deducting the selling and distribution costs.[6] The refining industry has historically suffered from low and volatile GRMs. A refinery usually earns a very small margin on each barrel of crude oil process, typically in the range of 1% to 10% of gross revenues. Individual refinery margins are however influenced by a variety of complex technical and economic factors.

The technical configuration of a refinery is one of the most important factors in determining its ability to generate GRMs. The greater a refinery's ability to convert crude oil to lighter products, the greater the margin that will be earned. Table 7.2 summarises the GRMs on a per barrel basis for three different refinery configurations. The simple configuration is able to produce 50% light products, the remainder being fuel oil. The complex configuration is able to produce 65% light products and the deep conversion configuration is able to produce 95% light products. Crude oil is assumed to cost US$ 65 per barrel. Light products sell at a 20% premium as compared to crude oil and fuel oil at a 15% discount. No losses are assumed and prices are on a delivered and netback basis.

TABLE 7.2 GRMs per Barrel for Three Different Refinery Configurations

	Simple configuration	Complex	Deep conversion
Light product	39*	51	74
Fuel oil	28**	19	3
Product revenues	**67**	**70**	**77**
Crude oil cost	65	65	65
GRM	**2**	**5**	**12**

**50% of US$ 65 per barrel multiplied by 1.2.*
***50% of US$ 65 per barrel multiplied by 0.85.*

6. The term 'netback' is commonly used in the petroleum industry to describe prices that are determined after deduction of selling and distribution costs.

It can be seen that as fuel oil is sold at a discount to crude oil, the greater the proportion of fuel oil in the product slate, the lower the GRM. A change in the configuration that results in a reduction in fuel oil production has a dramatic impact on the GRM. Assuming a throughput of 200,000 barrels per day or approximately 69 million barrels per year, the three refinery configurations earn gross margins of US$ 138 million, US$ 345 million and US$ 828 million, respectively. The difference between the simple and deep conversion refinery is US$ 690 million per year, which demonstrates that refinery configuration is clearly a critically important consideration when assessing refinery project risks. When considering the viability of a particular refinery project, it is thus essential to fully understand the relationship between the technical configuration of the refinery and the ability of the project to generate sustainable long-term GRMs.

GRMs are also influenced by several other factors. The type of crude being processed is a strong determinant of the product slate, including the quantity of unwanted by-products. Heavy, sour crudes produce more fuel oil and require more expensive equipment to remove sulphur. Refineries processing these types feedstock will therefore earn lower margins if the crude is purchased at the same price as light, sweet crudes. In practice, heavy, sour crudes usually sell at a significant discount and hence refineries that are able to process this type of feedstock often earn the highest margins. The target market for the refined products can also be an important determinant of GRMs. High netback prices can often be earned in protected markets. A refinery may enjoy monopoly status in its target markets. Infrastructure bottlenecks can, for instance, keep competition out. Governments may also protect domestic refineries through various measures, including taxes, subsidies and environmental regulation. In such cases the margins earned by a refinery may be artificially supported due to specific local conditions.

7.3.2 Crude Oil Supply

Normal operation of a petroleum refinery typically involves the continuous processing of crude oil 24 hours per day and invariably on a year-round basis. Given the tight margins earned by a typical refinery, any disruption to the supply of crude oil could clearly pose a serious risk to the viability of the project. Crude oil is readily available on the open global markets and hence a refinery should be able to access alternative supplies of crude oil in the event of feedstock reductions. In practice, however, a particular refinery may be severely constrained in its ability to replace any lost feedstock supplies. A refinery may be configured to process only a narrow range of crude oil specifications. Furthermore, refineries are often constrained in their ability to import crude oil. A refinery may be supplied from a dedicated source and infrastructure may not be available to import crude from elsewhere. This is especially the case for inland refineries supplied by a single pipeline. The risks associated with crude oil supply will thus depend to a significant extent on the particular characteristics of the project.

7.3.3 Technical, Completion and Operating Risks

Petroleum refineries are large, integrated industrial systems and hence the technology employed to convert crude oil into refined products is complex. Although the basic refining technologies have existed for many years, the complexity of the refining process creates many challenges for lenders and investors. Few greenfield refineries have been built over the last several decades. Furthermore, process integration on the typical scale of a refinery presents significant design challenges especially when deep conversion processes are employed to handle more difficult crude specifications. Refinery development is also expensive and a greenfield refinery is likely to cost tens of billions of dollars. Refinery development also usually involves global procurement of plant and equipment and is thus well beyond the scope of a single EPC contractor. The technical and completion risks involved in refinery project development are thus generally considered to be high, requiring careful management and control.

Once the project is complete, the focus then moves to efficient and reliable operation to ensure that profitability is maximised by maintaining high levels of availability and throughput. It is not unusual for refinery projects to be developed on the basis of 95% plus availability. Unplanned outages, even for relatively short periods, are likely to have a severe impact on project cashflows. In addition, refineries operations are complex and hazardous involving the processing of flammable and toxic material at high pressure and temperatures. To successfully develop and operate a petroleum refinery it is thus essential for the project to be sponsored by experienced industry operators with a strong track-record in operating similar facilities.

7.3.4 Macroeconomic Risks – Currency and Exchange Rates

Macroeconomic risks include the risks relating to changes in economic growth rates, inflation, interest rates and currency movements. These risks are part of the general country risks which impact all projects to some extent and are largely outside the control of the project sponsors. Refinery projects do, however, present certain specific risks to investors and funders, particularly in relation to currency and exchange rate movements. Refinery projects that import crude oil paid for in US dollars and sell refined product into the local market for domestic currency are exposed to considerable exchange rate risk. A large proportion of a refinery's cost base will be denominated in US dollars, not only in relation to crude oil purchase costs but also debt service, given that loans are likely to be dollar denominated. A weakening of the domestic currency will increase the US dollar costs relative to the domestic currency revenues. This can rapidly erode the gross refinery margin at the same time as dollar-based debt servicing costs are increasing. A more serious scenario involves restricted availability of foreign currencies due to severe devaluations, capital flight, currency moratoria and so on. In this case there may be a shortage of foreign currency available within the country to pay for crude oil imports and service debt. Currency movements can have other impacts on the financial performance of refinery projects. Refineries normally hold significant crude oil and refined product inventories. These inventories are often also dollar-denominated and hence movements of dollar exchange rates can result in large accounting gains and losses. In extreme cases these movements can impact a project's ability to distribute funds.

There are a variety of methods for mitigating the risks, which typically involve either some sort of risk management structure (hedging), or investment agreements with governments that include dollar-based product sales to government agencies and guarantees of foreign currency availability. Hedging structures for refineries will be examined further in Section 18.5.4 while government implementation agreements will be dealt with in more detail in Section 7.4.2.

7.3.5 Environmental Risks

Refining industry operations and processes can have highly detrimental environmental and social impacts not only due to the refinery processes themselves but also as a result of the wider end-usage of the industry's products. As a result, governments impose a range of regulations on the petroleum refining industry. These regulations cover petroleum product specifications, refinery plant emissions, health and safety, release of toxic and hazardous substances. In the developed world petroleum refining has become one of the most highly regulated industry and, due to the cost and complexity of complying with regulations, this has resulted in plant closures. Environmental impact more generally will be examined further in Chapter 12.

7.4 COMMERCIAL STRUCTURE AND CONTRACTS

Petroleum refiners enter into a variety of commercial agreements with crude oil suppliers, product offtakers, construction and development contractors, service providers and so on. A characteristic of the refinery industry is that many commercial relationships are agreed on a short-term or even spot basis. It is often found, for instance, that petroleum products are sold to local distributors on the basis of annual renewable contracts. A refinery which lacks upstream integration and buys and sells on a short-term basis is normally known as a 'merchant' refinery. Merchant structures can create significant difficulties for project financing, as lenders usually require a higher level of cashflow certainty through long-term contracts. A common commercial structure that is designed to isolate a refinery from short-term price movements is the 'toll' or 'processing' arrangement whereby the refinery is paid a fee by a toller or processor. Tolling structures are considered in more detail later.

7.4.1 Corporate Structures

There is a wide range of corporate and ownership structures in the refinery industry. Many refineries are owned by the international oil companies as part of their vertically integrated global operations. Some refineries are state-owned by national oil companies whilst others are owned by independent refiners. Although many recent refinery projects have been developed as joint ventures, in contrast to the upstream industry unincorporated joint venture structures, are rare. It is not, however, always possible to structure a refinery project financing on the basis of a single purpose incorporated company. Often refinery activities are located within wider group structures, which could include upstream, distribution, marketing, utility supply, petrochemicals and natural gas activities in addition to refining. Such group structures often include a significant proportion of intra-group transactions and common ownership along the value chain. Furthermore, refinery projects often involve existing operations or infrastructure and in these cases project loans may be made to an existing entity, which has historical cashflows. Overall corporate structures in many refinery project finance transactions can be complex and far-removed from the concept of a single purpose project borrower. Although not necessarily unmanageable, structural complexities can present significant challenges in the development of bankable transactions.

7.4.2 Government Implementation Agreements

In certain jurisdictions, in order to mobilise investment and funding for refinery projects, it may be necessary for the government to provide specific assurances to investors and lenders. This may be required, for instance, if the existing legal and regulatory framework governing the refinery sector is undeveloped or does not make specific provision for private ownership and financing. In these cases the government will normally enter into an implementation agreement with the project sponsors which details the nature of the support provided by the government. Implementation agreements will usually cover access to foreign exchange, the legal and regulatory framework for the project, government support in obtaining permits and approvals, exemptions from certain taxes and duties, guarantee of the performance of relevant state-owned contract counterparties and so on. Implementation agreements may also include detailed terms covering land rights and access to necessary infrastructure (ports, railways, etc.). Finally, important legal provisions covering dispute resolution, stabilisation clauses and waiver of immunity will also usually be incorporated into implantation agreements.

Government implementation agreements are often critically important to the viability of refinery projects in emerging markets. The constitutional status of implementation agreements will need to be fully understood, including any parliamentary approvals, decrees, etc., which may be needed to ensure that the government is legally authorised to bind itself to the terms of the agreement. Lenders will also scrutinise the terms of these agreements and expect to enter into direct agreements with the government to ensure that their interests are fully protected. The negotiation of these agreements can be difficult and time-consuming especially if the relevant government authorities are inexperienced in negotiating with private investors and lenders.

7.4.3 Crude Oil and Feedstock Supply Arrangements

There is a wide range of different types of supply arrangements for feedstocks to a refinery project. Ship-borne imports of crude oil may be procured on a short-term or spot market basis from the global markets. Alternatively a dedicated source of crude oil could be transported through a pipeline on a long-term supply basis. Furthermore, the feedstocks for refinery projects are not restricted to crude oil. Other feedstocks could include atmospheric residues or other processed materials. The contractual arrangements for the supply of crude oil and feedstocks to refineries are equally varied ranging from standard form spot and short-term contracts to tailored and specific medium and long-term contracts. Whatever form a contract takes, however, the following broad terms will typically be covered.

- *Term and commencement*: The obligation to supply crude oil or other feedstocks may be restricted to a single spot cargo or be for longer-term periods (from 1 year to 20 or 30 years). For most projects the delivery obligations will be deferred for the period of time during which the project is being developed.
- *Quantities*: For longer-term contracts the quantity to be delivered is usually expressed as a total maximum number of barrels per day. Daily nomination procedures will typically be included. Some contracts may condition the delivery commitments to general crude oil production policies and make reference to nationally imposed prioritisation policies in case of supply restrictions.
- *Quality and testing*: Crude oil and feedstock specifications may be generic and refer to a particular type of material (Arabian Light, Oman Export Blend and so on) or be based on detailed assay type specifications. Particular test methods and testing procedures will also be included in the contract.
- *Price*: Pricing regimes in supply contracts vary significantly but will typically be based on reference to benchmark prices (Brent, WTI and so on).
- *Delivery and logistics*: Delivery will typically be by pipeline or ships and the terms of supply contracts will normally include provisions for delivery based on Incoterms definitions. The delivery of crude oil by pipeline may involve the project paying for pipeline capacity. For sea-borne delivery, supply contracts will include detailed provisions covering vessels, unloading, laytime and so on.

The crude oil supply arrangements for a refinery project can create significant challenges for project financing. It is common practice in the refinery industry to optimise refinery profitability by varying the type and volume of crude oil processed sometimes on a short-term basis. Optimisation of refinery profitability will depend on market conditions, which can change dramatically over short time periods. Furthermore, crude oil supply arrangements are often agreed pursuant to relatively standardised contracts, which may be difficult for lenders to accept. Standardised contracts may not adequately address the specific circumstances of a particular project and, hence, amendments to contract terms will often be required to address lender concerns. Given that the level of risk associated with crude oil supply is highly dependent on the specific characteristics of a project, the contractual arrangements required to satisfactorily mitigate supply risks are also likely to be customised to the project.

7.4.4 Sales and Marketing Arrangements

A variety of contractual arrangements exist that underpin the commercial relationships between petroleum refiners, product offtakers, distributors and marketers. These arrangements vary according to the type of product being sold as well as the particular characteristics of the market within which the refinery is operating. Some refiners act as the sole supplier in their particular market and are mandated by the local authorities to supply product to distributors and marketers at a regulated price. Other refiners operate in more open markets where prices are driven by supply and demand and numerous suppliers selling into a highly competitive market. The nature of the product also varies. High volume transportation fuels such as gasoline and diesel may be sold on a spot basis or short-term (annual) contracts. Speciality products, which are directed towards a dedicated user, will normally be sold under long-term contracts. The commercial arrangements for these dedicated sales will normally include provisions to reflect any specialist infrastructure required to provide the dedicated supply. These kinds of commercial contract are especially common when refineries supply feedstock to nearby petrochemical facilities.

Sales contracts for refined product will include typical terms that are found in other types of sales contracts including quantity, product specifications, price, agreement term, payment, delivery and logistics and so on. We have already seen that product specifications can vary considerably depending on the particular market where the product is being sold. The ability of a particular refinery to meet the specifications of the target markets is thus essential. Lenders to a refinery project financing will want assurance that the marketing plans are achievable, given the technical configuration of the project and that these plans are underpinned by acceptable contractual arrangements with offtakers.

The pricing provisions of refined products sales contracts will also be carefully examined by potential lenders. Refined products are usually priced by reference to official selling prices or are formula-based using regional benchmarks. In this regard, Platts[7] posted prices in particular regions are commonly used in offtake contracts. Product specifications, logistical costs and other factors are usually incorporated into these formulae to arrive at a premium or discount to the benchmark prices for the relevant product.

7. Platts is a provider of benchmark pricing information. See www.platts.com.

7.4.5 Operations and Maintenance Arrangements

The arrangements for operating and maintaining a refinery project vary according to a number of factors, including the corporate structure and sponsorship of the project. In most circumstances, a joint venture refinery operation will be independently resourced and managed. In the initial stages of the project, if the joint venture includes partners with refinery experience and track record then many of the key positions in the project will often be staffed by experienced sponsor secondees. The project may also enter into technical services agreements with experienced project sponsors. In many jurisdictions the project sponsors will, however, be obliged to maximise local resourcing content and hence a significant proportion of the operational resources are likely to be hired locally.

In certain circumstances refinery projects may be developed on the basis of third-party contractors providing operations and maintenance (O&M) services. The exact scope of O&M services provided pursuant to an O&M contract are highly variable as is the extent of risk transfer and the remuneration structure. O&M contracts in the oil and gas sector are, however, more commonly encountered in infrastructure type projects and will be covered in more detail in Section 8.4.4.

7.4.6 Toll-Processing Agreements

Toll processing is an arrangement whereby an owner of a processing plant agrees to process raw materials into final products on behalf of a third party. The plant owner is usually known as the 'toller' and processes the raw materials for the 'user'. Toll processing is used in a variety of circumstances particularly when an organisation has access to raw materials and product markets but lacks expertise in refinery processing. This may be the case, for instance, where a state-owned company has access to petroleum reserves but seeks third-party expertise to refine the crude oil for delivery of product back into the local market.

The essence of a refinery toll-processing agreement is the provision to the user of refinery services by a toller in return for a tolling fee. The fee is normally calculated on the basis of the availability of the refinery and the costs of processing the crude oil. The important feature of a tolling agreement is that it removes price and volume risk from the plant operator. The toller is thus in effect leasing the facility to a third party. As a result, the project cashflows should be much more predictable and stable. A toll-processing agreement will usually cover the following terms:

- *User*[8]: The viability of a long-term tolling agreement is largely dependent on the ability of the user to honour its obligations for the term of the agreement. Project lenders will, in particular, need to carefully assess the credit worthiness and dependability of the user.

8. Toll-processing arrangements may also be used to provide services to multiple users.

- *Processing services*: The tolling agreement will detail the services to be provided by the toller, including storage, utilities, logistics support and so on.
- *Feedstock supply and product offtake*: The user is responsible for supplying the correct quality crude oil feedstock and the toller for the final on-specification products according to an agreed production. The agreement will need to include detailed provisions relating to off-specification feedstock and products.
- *Tolling fees*: Tolling fees are normally based on fixed and variable components to compensate the project for fixed and variable costs together with an agreed rate of return for capital invested. A debt service component to the fee may or may not be included. If not included, then the element of the fee relating to investment return will need to be sufficient to ensure that debt can be serviced with an acceptable level of cover.
- *Term and termination*: Project lenders will expect the term of the agreement to last for at least the tenor of the debt and preferably for a reasonable period thereafter. Termination of a toll-processing agreement could have a catastrophic impact on project cashflows and the financing structure. Without a toll-processing agreement the refinery is likely to be operating on merchant-basis and be fully exposed to variability in refinery margins. Lenders will therefore expect the ability to terminate to be highly curtailed and compensation provisions to apply if the agreement is terminated.[9]

The technical provisions of a toll-processing agreement for a refinery can be complex. The aim of these provisions is to ensure that the refinery is technically able to produce the desired products given the specification of the supplied feedstock. A production committee may be established to manage the technical aspects of the toll-processing arrangements. Annual and monthly production programmes are agreed and form the basis of the refinery planning and scheduling for the relevant period. For long-term toll-processing agreements, it may be necessary to make allowance for modifications to the refinery if changes occur in the specification of feedstock and/or the market requirements. The toll-processing agreement will also need to address storage requirement for feedstock and product as well as detailed provisions covering the supply and lifting of materials. Marine interfaces can add a further level of complexity given that mechanisms will normally be required for vessel acceptability and notification, loading and unloading, laytime, demurrage and so on.

Overall, toll-processing agreements represent a flexible form of risk transfer for refinery projects. The bankability of any particular tolling structure will, however, depend to a large extent on the specific terms of the agreement and the identity of the users of the facility.

9. The structuring and negotiation of termination provisions can be complex and protracted. Lenders will typically expect that sums payable in the event of contract termination are, in all circumstances, at least sufficient to prepay all outstanding debt.

7.4.7 Construction Contracts

Refinery projects are usually much too large to be constructed pursuant to a single construction contract. There are normally several contracts signed with contracting consortia for specific parts of the plant. These different contract packages typically cover specific elements of the refinery, including the basic refinery process units, specific licensed technology packages, utilities, infrastructure and so on. The management of multiple contracts with diverse consortia is a complex undertaking and hence strong integrated project management teams are an essential feature of refinery project development. The issues that need to be considered concerning construction and development contracts for refinery projects are similar to those for other processing plant projects and will be covered in more detail in Chapter 12.

7.4.8 Other Commercial Arrangements

There are a variety of other commercial arrangements which are important for a refinery project, including technology licensing, catalyst supply, land and property rights and third-party facilities.

Technology Licensing, Catalyst Supply and Technical Services

Refinery configurations normally employ both unlicensed (open art[10]) and licensed technologies. Many of the more sophisticated upgrading processes are subject to patents and project developers will hence need to obtain necessary intellectual property rights in order to develop and use the technology. As well as granting the necessary rights to use the relevant technologies, technology licence agreement typically also cover the provision of design information, technical services and assistance and so on. Many refinery technologies rely on the use of sophisticated catalysts that are essential for proper operations. The commercial arrangements for the supply of catalyst are therefore an important element of the project. Many of the issues that need to be addressed when considering the technology licensing and catalyst supply are similar to other projects, especially projects in the petrochemicals industry. These issues will hence be examined further in Section 11.4.4.

Land and Property Rights

Refineries are significant industrial complexes and occupy industrial sites covering large areas. A greenfield refinery may, for instance, require several hundred acres of land. Refineries also need land rights for other purposes including easements rights for pipelines crossing other owners' land, rights to jetties and

10. Open art technology is non-proprietary and as a result is generally not subject to restrictions on use due to intellectual property rights.

near shore land and so on. Land and property rights are thus critically important for refinery projects but also raise a number of key issues that need to be carefully addressed. If the refinery land is leased then identity of the landlord and the terms of the lease agreement will be of fundamental importance to the project. Many leases include onerous obligations, particularly regarding environmental impact, land restoration and so on. The lease may, for instance, include obligations on the project company to restore the site to its original condition if the lease is terminated. Furthermore, the ability to transfer land and property rights to third parties, including lenders, will be an important consideration, especially for project finance transactions. Lenders and their legal advisors will therefore undertake detailed due diligence on the various land and property rights which are relevant to the transaction.

Third-Party Projects, Shared Facilities and Utility Supply

A refinery project may rely on projects developed and operated by third parties outside the control of the refinery. Utilities and industrial gases are, for instance, often supplied to refineries by third parties. Refineries may also share facilities with other parties. Port infrastructure and common storage facilities are often shared between various projects. Refinery projects share many of the same third-party issues with petrochemical projects and these issues will hence be examined in further detail in Section 11.4.5.

Chapter 8

Pipelines, Storage and Other Infrastructure

Chapter Outline

8.1 INTRODUCTION

The oil and gas industry requires an immense system of infrastructure to provide the vital link between the upstream oil and gas resources and the final consumer markets. The critical components of this complex system include pipelines, ships, ports, terminals and storage tanks, which together form the midstream oil and gas industry. The purpose of this chapter is to describe the risks and contracts that are commonly found in oil and gas infrastructure projects. Although infrastructure is required throughout the whole industry value chain, given that the offshore industry is in many ways unique, offshore infrastructure will be covered in more detail in Chapter 9.

Section 8.2 explains the general characteristics of oil and gas infrastructure with particular emphasis on pipelines and storage facilities. Oil and gas industry infrastructure fulfils a variety of essential functions and it is important to understand the basic characteristics of the different types of infrastructure in this sector.

Section 8.3 then follows on into a more detailed examination of the principle project risks in this sector. Infrastructure capacity is typically sold on a long-term basis to a variety of different users. Some of the most significant risks in this industry therefore relate to the various types of usage or capacity reservation contracts. In addition, oil and gas infrastructure is often highly regulated and exposed to high levels of environmental risk.

Section 8.4 covers the commercial and contractual arrangements that are typically encountered in the industry. The contract terms that form the basis of a particular infrastructure project finance transaction will often, to a large extent, determine whether the project is ultimately bankable.

Section 8.5 examines the economics and financing of oil and gas infrastructure projects. This is highly capital intensive sector and the cost structure of the industry is largely based on returns on capital. Infrastructure revenues are generally tariff-based with a high element of capital return embedded in the tariff calculation. The regulatory framework, which governs infrastructure projects, can have a significant impact on project economics, usually through government regulation of tariff levels and the imposition of competitive mechanisms into potentially monopolistic structures.

8.2 FUNDAMENTALS OF PIPELINES AND STORAGE

The following sections explain the fundamental characteristics of the pipeline and storage business.

8.2.1 Pipelines

Pipelines are used to convey fluids from one location to another in a safe, efficient and reliable manner. Crude oil and natural gas are often found far from the final consumer markets and therefore need to be transported over great distances. Pipelines have traditionally been the most cost effective means of transporting the many different types of fluids handled by the oil and gas industry and, as a result, an extraordinarily complex and sophisticated network of different types of pipelines now extends throughout the whole industry.

Types of Pipeline and Cost of Investment

The different types of pipeline that exist in the oil and gas industry reflect the variety of fluids transported, the location of the pipelines and the specific use to which the pipelines are employed. Pipelines broadly fall into one of three categories, namely crude oil, natural gas and product. Each category has its own features and characteristics reflecting the differing natural of the material being transported.

- *Crude oil pipelines*: There are many different types of crude oil pipeline. Some carry crude over short distances from wellheads to processing facilities. Others carry very large volumes (up to 1 million barrels per day) over thousands of kilometres. Pipelines carrying heavy and viscous crude oil have different characteristics compared to those carrying lighter crudes. The technical, environmental and economic risks associated with these different types of pipeline are distinct and project finance structures will usually include specific features to account for the variability of risks according to the specific circumstances.

- *Natural gas pipelines*: In a similar way there are a variety of natural gas pipelines. Gas transmission pipelines transport high volumes of gas at high pressure[1] over long distances. These pipelines typically connect producing regions to final consumer markets. Distribution pipelines operate at lower pressures and link transmitted gas to the final consumers.
- *Product pipelines*: Product pipelines transport finished petroleum products such as diesel, petrol, jet fuel and chemicals from refineries and fuel storage terminals to final consumers. Product pipelines can be dedicated to a single type of material. Airports, for instance, are often serviced by large dedicated pipelines for the supply of jet fuel. Other pipelines are designed to carry more than one type of fluid. Product pipeline capacity is typically sold to multiple users.

In addition to these three broad categories of pipeline, additional considerations apply to specialist pipelines operating in particular conditions or types of service. Examples could include pipelines operating in arctic, seismic or environmentally sensitive locations. Although lenders to pipeline projects generally take the view that pipeline technical risks are lower compared to other types of project in the industry, the specific nature of the pipeline risks needs to be accommodated in the project finance structures. Despite a higher degree of technical risk, a variety of ultra-deep water and long-distance sub-sea pipeline projects have, for instance, successfully raised project finance.

Market Demand, Project Capacity and Pipeline Development

Investment in pipeline capacity is made in response to market demand for the product being transported. Once the need for pipeline transportation has been identified, the most important decision to be made concerns the design capacity of the pipeline. This will determine the investment requirement. If the pipeline is over-sized then costs will be too high, which could ultimately make the project uncompetitive. If the pipeline is too small then the pipeline infrastructure will act as a bottleneck and over-investment in the upstream facilities can also have a significant negative economic impact. Ensuring that the pipeline capacity is optimal for both market conditions and upstream deliverability is, therefore, a critical aspect to ensure project viability.

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1. A large natural gas transmission pipeline could be capable of transporting up to 30 billion m^3 of gas at pressures of around 200 bar.

There is often considerable uncertainty surrounding the future volumes of fluids, which a pipeline may have to handle. Predicting the volumes to be transported over the life of the project can be difficult particularly if the transported materials are being sold into a new market or the upstream supply is from a new dedicated source. There are various options for building flexibility into a pipeline system, including the ability to install further capacity in parallel to an existing pipeline[2] or install additional compression or pumping facilities to increase pressures and flowrates. The design decisions made early in a pipeline project can have a significant impact on future project economics and viability.

Monopolies, Regulation and Environmental

The physical nature of pipeline infrastructure and the significant capital investment required to install pipelines results in high barriers to entry. The owners of pipeline infrastructure are often in a position to exert considerable market power and hence act in a monopolistic fashion. Governments will usually intervene to prevent market abuse with the goal of ensuring effective access at reasonable prices to all market participants. The most important areas of regulation are tariff regulation, competition regulation and environmental and social impact.

- *Tariff regulation*. The most common method of pipeline tariff regulation is the setting of maximum tariff rates which operators are able to charge. The calculation of this maximum tariff is usually based on some form of assumed operating cost and return on capital or assets.[3] The tariff also usually needs to include a provision for ongoing maintenance and capital costs. The calculation and agreement of regulated tariff can become contentious and subject to dispute. Furthermore, there is always a risk that governments and regulators change the basis of tariff calculation in future periods. Given that tariffs are an essential component of the cashflow generation of a project it is essential that the tariff-setting framework is clear and fully understood by lenders to a project.
- *Competition laws*. Governments usually enact competition laws that are aimed at eliminating monopolistic behaviour and ensuring that markets are as open and competitive as possible. Access to infrastructure in order to deliver products to market is one of the critical components in a market supply chain. Pipelines occupy a central position in the logistics of the petroleum industry and free access to pipeline infrastructure is thus vitally important to ensure that an effective and competitive market exists. A key mechanism which regulators use to ensure that access to pipeline infrastructure is not

2. Adding a parallel pipeline to an existing system is commonly known as 'looping'.
3. A common method of determining regulated infrastructure tariffs is the regulated asset base or 'RAB'. The RAB methodology is based on a regulator setting tariff levels by reference to an allowable rate of return applied to permitted assets. Pipelines are subject to RAB tariff methodology in a number of jurisdictions.

restricted is the enforcement of third-party access rights. Third-party access rules usually include the requirement for owners of monopoly infrastructure to allow access to a variety of users on the most competitive terms. Third-party access rules can become a significant issue when considering project finance, as lenders will want to ensure that projects are underpinned by strong long-term shipping contracts, entered into with creditworthy counterparties. Although market regulators will consider exemptions from the third-party access rules, any such exemptions will require very strong justification.

- *Environmental and social impacts*. The construction and operation of pipelines can have significant environmental and social impacts. Long-distance pipelines involve the disruption of large areas of land along the pipeline route. Fluid leakage from pipelines can likewise impact a wide area, especially crude oil leakages from trunk pipelines. The environmental and social impacts of pipelines can therefore present significant challenges and will be dealt with in more detail in Section 8.3.4.

It can thus be seen that the pipeline business is subject to a considerable level of control by national governments and that many of these controls can have a significant impact on the bankability of particular projects. As a result, project sponsors, lenders and investors should not underestimate the amount of time that will be needed to be spent on regulatory issues during the project finance structuring process.

Cross-Border Pipeline Projects

When the route of a pipeline passes over national borders additional challenges arise that add significantly to project complexity. The international element means that project sponsors not only need to ensure that all of the relevant national regulations are addressed but also that the relationships between the different national governments are controlled. The governments of the countries through which the pipeline is routed need to work together to successfully develop the project. Transit states are likely to be able to earn significant revenues not only from transit tariffs and taxation but also potentially from the additional benefits of gas supply into the country. Despite these economic benefits, the international nature of a project can present additional challenges to the routing of the pipeline. The cheapest and most efficient route may not be possible due to the relationship between particular states. As a result, the selection of the route can often be driven by political factors as much as economic factors and lenders to a cross-border pipeline project will need to assess the long-term political and economic viability of the venture with great care. Changing political relationships between states can have a highly detrimental impact on the development and operation of pipeline projects. Transit states may hold upstream producers and downstream buyers to ransom by threatening to cease the flow of material through sections of the pipeline. Disputes between states over gas prices and transit tariffs can escalate and, in the worst case, result in reduced flows. There are numerous recent examples of severe disruption to cross-border pipeline projects due to political disputes between neighbouring states. Project finance lenders will therefore approach the political dimension of cross-border pipelines with great caution.

Whatever the specific features of a particular project, the success of a cross-border pipeline project will be highly dependent on strong political support from all concerned governments. The various methods of mobilising political support and mitigating cross-border risks will be covered later in Section 8.4.2.

8.2.2 Storage and Other Infrastructure

Different types of storage infrastructure exist throughout the oil and gas industry, including large crude oil import and storage terminals, refinery tank farms, low temperature storage of LNG, underground gas storage facilities and so on. Although the motivation for investing in storage infrastructure is driven by many different factors, there are broadly three key reasons for making an investment.

- *Supply and demand imbalances*: Investment in storage is usually required to even out movements in supply and demand. Disruptions in the supply chain can be accommodated by including storage into the supply system. If, for example, the dedicated supply of crude oil to a refinery needs to be curtailed for a number of days to carry out maintenance work then stored feedstock can be used to continue supplying the refinery.
- *Security of supply*: Governments often stipulate minimum storage requirements for crude oil and petroleum products at a national or regional level. These strategic reserves are imposed by national authorities to ensure that countries can cope with short-term supply disruption. Security of supply is also an important consideration at the level of a particular project and adequate storage capacity is an important risk mitigation measure for most projects.
- *Speculation and arbitrage*: Storage is also used by traders and speculators to profit from price movements over time. Storing low priced natural gas in the summer for use in winter is an example.

As far as project finance is concerned, many of the considerations that have been covered earlier for pipeline projects, also apply to storage projects. To mobilise capital for storage projects investors and lenders will want assurance that there is an obvious requirement for the capacity. It is highly unlikely, for instance, that lenders will accept the risks associated with speculative storage capacity. In common with pipeline projects, storage infrastructure is also highly regulated in terms of market abuse, third-party access, environmental impact and so on.

Storage infrastructure is often included as part of a project's capital cost and the availability of on-site storage for both raw materials and products can be a significant risk mitigant. Lenders to refinery, petrochemical and LNG projects will often look in detail at the storage facilities available to the project. This can become a contentious area with lenders seeking more storage to mitigate risks whilst sponsors arguing that excessive storage capacity will make a project uncompetitive. Project sponsors should, however, understand lender concerns, especially if the project is exposed to high levels of disruption risk particularly to feedstock supply.

8.3 PIPELINES, STORAGE AND INFRASTRUCTURE RISKS

The transportation and storage sector of the petroleum industry value chain has a different risk profile compared to the upstream extraction and downstream processing activities. The cashflow risks are in general assumed to be lower and reflect the infrastructure nature of the business. Cashflows are expected to be more stable and less influenced by market risks and geological risks. The physical assets found in this sector typically have long lives and, provided the feedstocks and product flows are maintained, the commercial value of these projects have equally long lives. This feature is a key driver of financing for this sector of the petroleum industry value chain whereby project sponsors are normally seeking the very long tenor debt financing to underpin the stable, long life cashflows.

Although infrastructure projects in the petroleum industry share many features with infrastructure projects in other industries, there are important differences. Oil and gas infrastructure is often developed for specific users and the risks associated with the utilisation of the assets ultimately lies with the performance of these users. Oil and gas infrastructure projects may involve residual market risks if contracts are terminated or not renewed. The value of storage and transportation assets (including pipelines and ships) can be extremely difficult to predict. As a result, whilst infrastructure can generally be classified as a lower risk element of the petroleum industry value chain, this sector cannot be completely divorced from the rest of the value chain.

8.3.1 Capacity Usage and Market Risks

The infrastructure business earns income by selling future capacity rights to a variety of different users. The commercial viability of oil and gas infrastructure projects thus depends largely on the underlying demand for transportation, storage and other services. For a particular project, if the capacity or service is sold long-term to particular users for a fixed fee (such as an availability payment or rental) then volume and price risks are largely eliminated. If a suitably robust contract is in place then projects in the midstream industry should be able to generate more predictable and lower-risk income.

This does not mean, however, that risks to income volatility can be ignored. The underlying contract terms are critically important and project risks depend on the quality of the underlying contracts. The extent of risk transfer, which has been agreed through the usage contracts, will be an important factor in determining the bankability of any particular project. Ideally capacity should be sold pursuant to strong long-term contracts whereby the fees are paid in all circumstances. Such arrangements are known as 'hell-or-high water'[4] contracts or for pipelines, 'ship-or-pay'. Although these types of contract represent the greatest transfer of risk, in practice it may not be possible to find a counterparty willing to accept such arrangements. Users often seek exclusion from payment obligations for various events, including political risk, strikes, weather conditions, reserves risks and so on.[5] Even if full risk transfer is possible through a hell-or-high water type arrangement, there is still a risk that the ultimate payer may not be able to pay due to bankruptcy, etc. A major factor when considering infrastructure type structures is thus the credit quality of the counterparty.

In addition, contracts may be terminated and replacement contracts may need to be entered into. There are circumstances where capacity may become uncontracted and in this case users will have to be found. This presents a significant risk to the viability of projects and their financings. It is thus important to establish that the underlying project is viable and that a long-term market exists for the capacity. It is no good building a pipeline if the ultimate market cannot in the long term accept delivery of the product. Likewise if there are doubts that the upstream reserves exist for the long term then the project viability is again questionable.

8.3.2 Construction and Operational Risks

Although the technology for transporting and storing petroleum products is well established, the particular circumstances of a project can raise material construction and operational risks. For pipeline projects, these risks are largely determined by the environment within which the facilities are located. Harsh environments can significantly increase design challenges which can result in cost overruns and schedule delays. Pipeline projects located in arctic type environments, deep water, mountainous terrain or earthquake zones can create particular construction and operational challenges. Pipelines which are to be used for unusual or challenging purposes will also create difficulties. A

4. A hell-or-high-water clause in a contract usually means that payments are made regardless of surrounding circumstances. Whether this is in reality possible is debateable and depends on the specific wording of the contract and whether the local law and local courts will uphold these types of arrangement.

5. These events are commonly termed 'force majeure' events and are dealt with in more detail in Section 13.6.

pipeline for transporting a highly viscous fluid, for instance, may require heat tracing. This requires additional capital investment and may introduce additional risks. If the heat tracing fails then the pipeline could become inoperable even beyond repair. Gas storage projects can also involve significant construction and operational risks. The performance of subsurface storage projects such as depleted reservoirs, acquifers and salt caverns are dependent on sub-surface geology, well performance and surface facilities. Cost increases and construction delays can arise due to the incorrect assumptions about the sub-surface environment. Seismic activity can impact gas storage projects and there have been cases of development work on these types of project supposedly triggering earthquakes.

8.3.3 Political and Regulatory Risks

We have already seen that oil and gas infrastructure is usually subject to a significant degree of government control and regulation. When considering the feasibility of investment in new infrastructure projects, political and regulatory considerations can be the deciding factors in determining project viability. In addition to domestic political and regulatory risks, oil and gas infrastructure can be exposed to significant international risks. The political conditions which impact cross-border pipeline projects can become especially complex given that project developers will need to manage project risks in several jurisdictions. The political relationship between the various countries will strongly influence the viability of cross-border pipeline projects. Given that project finance for these projects normally extends well beyond a decade, the challenges of forecasting political developments between different countries is multiplied.

Pipeline projects also tend to be particularly vulnerable to damage and supply disruption from vandalism, terrorism, war and sabotage. Pipeline infrastructure is a popular target for terrorists and during conflicts. Although pipeline repairs can often be completed relatively quickly, it is difficult to continuously monitor and protect the full length of a pipeline system. The cumulative disruption from ongoing attacks on pipelines can seriously interfere with the flow of material through a pipeline. Risks relating to pipeline damage and disruption are very difficult for project finance lenders to accept. As a result, lenders will often expect to undertake detailed due diligence on pipeline security risks and may only accept these risks if the project sponsors are prepared to provide some form of financial support in the event disruption to a pipeline impacts the ability of project cashflows to service debt.

8.3.4 Environmental Risks

Infrastructure projects are usually exposed to environmental and social risks that can often determine whether a particular project is bankable at all. The risks of leakages, spills, accidents and so on are high for most pipeline, storage and infrastructure projects. In addition, infrastructure projects often involve social disruption, including resettlement. The development phase of pipeline projects is usually especially disruptive. Onshore pipe laying, for instance, generally requires the clearance of wide pipeline routes, the excavation and remediation of the pipeline corridor and the handling of significant waste and spoil volumes. The disruption usually occurs over a long route and can involve the clearance of large areas of forest or other habitats. Offshore pipe laying also usually requires sub-sea route clearance and the deployment of speciailist pipe lay vessels. These activities can significantly impact the natural habitat through increased noise levels, disturbance of the sea bed and increased turbidity levels in the water column.

8.4 COMMERCIAL STRUCTURES AND CONTRACTS

The commercial and contractual structures that underpin oil and gas infrastructure projects can become complex. Multiple parties are often involved both as project sponsors and as users of the infrastructure. Government interests can further complicate the commercial structures. Cross-border pipeline projects, for instance, typically involve state entities acting in a variety of commercial roles, including as shareholders and shippers.

8.4.1 Corporate and Commercial Structures

Oil and gas infrastructure projects typically involve a variety of different parties. For a pipeline project for instance, there will usually be a resource owner (i.e., natural gas), the asset owner (i.e., the pipeline) and the resource buyer (i.e., the gas buyer). The relationships between these parties can be organised in a variety of different ways and hence corporate structures are normally tailored to the specific circumstances of the project. An important starting point is to establish the point of sale of the transported material. If the buyer takes delivery of the material at the exit point of the pipeline then the upstream resource owners will ship the material through the pipeline. If the buyer takes delivery of the material at entry point to the pipeline then the buyer will be responsible for shipping the material. Although not impossible, it is rare for the pipeline owner to purchase the material, transport it through the pipeline and then sell the material onwards. The point of sale can have a strong influence on the corporate structure of the project. If, for instance, the upstream resource owners are responsible for shipping then they may form a joint venture pipeline company to own the pipeline and raise the finance.

In addition to considerations regarding the point of sale and responsibility for transportation, other issues include tax, accounting and regulatory constraints can have a major impact on the choice of corporate structure. Pipeline projects in certain jurisdictions may, for instance, benefit from special tax treatment if structured in a particular way. In the United States, limited partnership corporate structures can significantly reduce the tax burden on pipeline companies. The location and tax jurisdiction of international pipeline projects is also an important consideration in determining how the project will be structured.

Given that the corporate structures of oil and gas infrastructure projects can have a significant impact on both the cashflows and structures of project finance transactions, careful consideration will need to be given at an early stage to the most appropriate structure to be used for a particular transaction. Structural features, which may appear attractive to project sponsors, may create bankability and risk transfer challenges when project lenders are asked to consider the transaction.

8.4.2 Host Government and Intergovernmental Agreements

Many infrastructure projects require some form of host government agreement (HGA) or concession agreement. This is especially the case for pipeline projects. Pursuant to these agreements the sponsors of infrastructure projects are granted the necessary rights to develop and operate the project. In addition, when infrastructure projects involve more than one government, some form of intergovernmental agreement (IGA) is usually required to ensure that the project is operating in a stable environment between governments. The Energy Charter Secretariat[6] has produced model forms for both host government and intergovernmental agreements. The major terms covered by these agreements are summarised as follows.

- *Host government agreements*: An HGA is in essence a specific type of concession contract. Pursuant to an HGA, governments will normally grant various important rights to the pipeline developers, including rights to land, the import and export of materials, foreign currency and so on. Governments will also usually agree to facilitate the project in the acquisition of concessions, agreement with government bodies, etc. The HGAs typically include special provisions for tax and incorporate stabilisation clauses for investment protection.
- *Intergovernmental agreements*: In the case of cross-border pipelines the project developers will usually need to enter into HGAs with more than one government. Proper coordination of the project will be required by all relevant jurisdictions to ensure consistent treatment and alignment of national objectives. The various governments will thus typically enter into

6. The Energy Charter Secretariat is a body established to monitor the implementation of the Energy Charter Treaty. This is a multilateral treaty which aims to mitigate risks between states associated with energy related investment and trade. See www.encharter.org.

agreements between themselves to ensure that a transparent and harmonious framework is in place between all parties. IGAs usually provide for the harmonisation of technical standards, taxation and environmental and social matters. Tax treatment, tariffs and transit fees are also usually covered to ensure agreement between all parties on the economic returns in each jurisdiction. Many of the provisions and terms of IGA can be the subject of extensive and complex negotiations.

A major issue which needs to be addressed concerns the authority of the government to agree to the terms of such concession agreements and the binding nature of the government's obligations on succeeding governments. The need to ensure that the government has the full authority to bind itself and future governments to the terms of the agreement introduces a significant element of political risk into the concessionary nature of these types of project.

8.4.3 Transportation, Usage and Storage Agreements

The pipeline and storage industries provide the basic infrastructure for the efficient operation of the petroleum industry supply chain. Third-party users of this infrastructure enter into long-term agreements with the asset owners pursuant which they reserve capacity rights. These agreements take a variety of forms and different terms are often used to describe these contracts, such as: transportation agreements, storage agreements, capacity rights agreements, availability agreements, usage agreements and so on. The income generated by these contracts represents the major source of cashflow for servicing project finance debt. Lenders and their legal advisers will therefore spend a considerable amount of time understanding the terms of these contracts, the most important of which include:

- *Reservation of capacity rights*: Capacity is usually reserved by reference to throughput or storage volumes for a defined period. For pipelines and storage facilities multiple users often reserve capacity and certain counterparties may be given priority capacity rights. The ability to reserve infrastructure capacity may be significantly constrained as a result of local anti-monopoly regulations, particularly third-party access rights.
- *Tariff*: Although calculations are often complex, the underlying principle of availability type agreements is that the tariffs paid by users should be sufficient to cover costs, including investment returns. In practice, infrastructure tariffs may be subject to local regulations which can constrain the ability of project sponsors to freely negotiate with third-party users.
- *Term and termination*: Infrastructure usage agreements can extend for varying periods. Project finance lenders will usually insist on the term of the agreement extending beyond the period of the loan and for termination to occur only in extreme circumstances.

- *Technical clauses*: Usage agreements will cover a variety of technical issues including entry and exit points, capacity allocation between multiple users, pressures, flow rates, product specifications and so on.
- *Payment terms and security*: Users of infrastructure capacity will usually need to provide some form of payment security, which may include parent company guarantees, letters of credit or even cash collateralisation.

The viability of a particular project will depend to a significant extent on the identity of the users of the infrastructure and the term over which these users commit to reserve capacity. Creditworthy contract counterparties making long-term commitments to use and pay for the infrastructure will usually be a precondition to project finance. Unfortunately, these types of arrangement can fall foul of local competition laws, especially if the tariff payments required to service debt and provide a reasonable return are considered excessive.

8.4.4 O&M Agreements

Infrastructure projects in the oil and gas industry often involve the project entering into O&M service contracts with third-party operators. The exact scope of these agreements varies depending on the specific circumstances but will usually cover the following broad terms.

- *Scope of services*: The scope of services can vary considerably but will usually cover: responsibility for staffing, organisation, operating procedures, maintenance activities, material and spare parts procurement, budgeting and so on.
- *Term*: For project finance transactions, long-term arrangements are normally required for a period extending at least as long as the debt tenor. Although operations will not normally commence until a project is complete, provision will need to be made for the operator to be involved in the project development phase.[7]
- *Remuneration structure*: Typical remuneration structures include fees with pass through of costs. Cost control is usually achieved through a budgeting approval process. Bonus and penalty regime are often included in the terms of the agreement to incentivise the operator to perform efficiently.
- *Liability, termination and replacement*: The liability of O&M contractors is typically low and restricted to the value of fees paid and this can create challenges when negotiating project finance transactions. The termination and replacement provisions can also be difficult to negotiate given that lenders will usually want minimum termination rights, direct agreements and the ability to replace an O&M contractor if performance is poor.

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7. Operators and operating personnel will typically need to be involved in engineering and design reviews, commissioning and start-up activities and so on.

Project finance lenders will normally examine the O&M arrangements in detail and lenders will often want to impose additional requirements into O&M contracts.

The identity, experience and resources record of the operator are also vitally important and will be scrutinised by project finance lenders to ensure that the O&M arrangements are viable for the long-term.

8.5 OIL AND GAS INFRASTRUCTURE TARIFFS AND ECONOMICS

The economics of oil and gas infrastructure is driven by the capital intensity of projects in this sector and the overall goal of cost reduction in order to achieve the cheapest possible options for storing, transporting and handling the industry's many different types of materials. When deciding between options, users of oil and gas infrastructure will want to select the lowest possible tariffs. Given that a large component of infrastructure tariffs relates to capital recovery, the cheapest tariff will almost invariably relate to the lower capital cost option.

8.5.1 Pipeline Economics

Tariffs for pipelines will need to be sufficient to recover costs and provide a return on capital. Pipeline tariffs are normally expressed on a monetary amount per unit of volume transported. The initial pipeline investment cost will have a significant impact on user tariffs and is influenced by a number of factors.

- *Size of the pipeline*: Pipelines benefit from economies of scale and hence building the largest pipeline possible is usually the most appropriate strategy although building over-sized pipes can result in stranded capacity if demand or supply is insufficient.
- *Gas or liquid*: Whether a pipeline is for gas or liquid transportation is an important consideration. Gas pipelines normally operate at higher pressures meaning more expensive fabrication costs and the additional need for compression equipment.
- *Location*: Offshore pipelines require specialist pipe-lay equipment, sea bed survey and so on. This adds to the cost of development. Onshore pipelines may pass through difficult terrain, such as mountains. Other considerations, which add to the investment cost, include location in seismic zones or the need to pass through environmentally sensitive areas.

The following example illustrates the importance of capital cost on the level of pipeline tariff. A 10 bcm natural gas pipeline is assumed to cost US$ 5 billion together with other assumptions detailed in Table 8.1.

TABLE 8.1 Pipeline Tariff Calculation

Assumptions		Tariff calculation	
Pipeline capacity	10 bcm p.a. or 360 million mmBtu p.a.	Annuity factor (20 years at 10%)	8.51
Pipeline cost	US$ 5 billion	Annualised capital cost	US$ 587 million
Investment period	20 years	Annual operating costs	US$ 150 million
Investment rate	10%		
Annual operating cost	US$ 150 million	Total annual cost	US$ 737 million or US$ 2.05 per mmBtu

To cover operating costs and earn a satisfactory return to investors, the pipeline users would have to pay a tariff of at least US$ 2.05 per mmBtu. It can be seen from this calculation that the largest component of the tariff relates to capital costs (representing approximately 78% of the annual pipeline cost). Pipeline tariffs are hence usually most sensitive to the assumptions regarding the annualisation of capital cost assumptions. If, for instance, a 15% return on investment is required then the tariff increases to US$ 949 million per annum or US$ 2.64 per mmBtu representing a 30% increase.

8.5.2 Economics of Storage

Investment in storage is usually made to reduce risk. Storage provides a buffer for supply disruption and allows a system to cope with variability in the flow of material into or out of the system. Investment in storage is thus similar in many ways to paying for insurance and, like insurance, the need for storage is related to the overall level of risk in the system. Significant uncertainties in the supply chain normally demand higher levels of security and larger storage capacity. Given that supply disruptions are a common feature in the petroleum industry and that disturbance to flow can cause significant losses, the levels of storage in the industry are high and often nationally important. Storage for natural gas is especially sensitive given that gas consumers are much more dependent on secure sources of supply compared to crude oil. Cross-border pipeline projects include the additional risks of disruption to supply due to actions taken by transit countries. A good example of this is the high level of perceived risk of supply from Russia and the significant investment made in gas storage infrastructure in European countries as a result.

Intrinsic and Extrinsic Value

Storage is not only used as insurance against risk events. Storage can also be used to profit from movements in prices over time. The concept is based on the strategy of buying a commodity at low prices, storing in anticipation of price rises and then selling. This strategy is profitable provided the price rise is sufficient to justify the costs of storage.[8] The concepts of "intrinsic" and "extrinsic" value are often used to describe the ability to use gas storage to profit from price movements.

- *Intrinsic value*: The intrinsic value of gas storage is typically based on the notion that gas can be bought cheaply during periods of low demand (normally in Europe during the summer) and sold in the winter when prices are high. The nature of demand and supply is not, however, predictable; in many regions, for instance, gas demand may actually be higher during the summer months due to air conditioning.
- *Extrinsic value*: The value of gas storage which is attributable to shorter-term variations in demand for gas is known as 'extrinsic' value and is based on the notion that the gas in storage can be traded on a shorter-term, even daily, basis, depending on price movements. This strategy is much more speculative and depends on the ability of the storage facility to react rapidly to changes in demand and supply.

A further consideration for gas storage economics is the requirement to provide a certain amount of gas, which will remain in storage and is required to maintain minimum pressure levels in the facility. This gas is known as 'cushion' gas and the cost of this gas forms an additional element to the investment cost in gas storage facilities. Given the potentially large volumes and high value of cushion gas, the arrangements for the provision and funding of cushion gas can create complexities in project finance structures for gas storage projects.

8. Two important terms are used to describe the relationship between current and future prices in the oil and gas markets. 'Contango' is a term used to describe the situation whereby future prices are higher than current prices whilst 'backwardation' is used to describe the opposite situation whereby future prices are lower than current prices. In a contango situation a trader should be able to profit by buying and holding a commodity, provided the difference in future and current prices is sufficient to cover holding costs, including storage.

Chapter 9

Petroleum Shipping and the Offshore Industry

Chapter Outline

9.1 INTRODUCTION

The shipping and offshore industries perform a variety of essential functions in the oil and gas industry. From the earliest days of the industry ships have been used to transport oil, gas, refined products and petrochemicals from distant locations to final consumer markets. Although the offshore services industry developed more recently, a wide range of different types of oil and gas infrastructure is now deployed in all types of marine environment. The shipping and offshore industry is therefore a large, complex and essential component of the modern petroleum industry. The purpose of this chapter is to explain the industry's fundamental characteristics and examine the risks and contracts commonly encountered in shipping and offshore projects.

Section 9.2 begins by looking at the main features of the shipping and offshore industries. Petroleum shipping shares a number of important characteristics with the general shipping industry and many of the players and commercial arrangements are derived from wider shipping industry practices. Likewise the offshore sector shares many important characteristics with the wider maritime industry.

Section 9.3 then goes on to cover the major risks in the shipping and offshore industries, the most significant of which include pollution and environmental risks, completion and development risk, insurance and residual value risks.

Section 9.4 then examines the main commercial and contractual arrangements encountered in this sector. There is a significant focus on charterparty arrangements, shipbuilding contracts and insurance arrangements.

Section 9.5 looks at the economics and financing for shipping and offshore infrastructure. There is a global market for petroleum shipping, which includes an active new build market, freight market, second-hand market and scrap market. The interactions between these markets are complex and present specific economic risks to lenders and investors in the shipping industry. The economics of the offshore infrastructure sector are driven by the costs of developing projects offshore.

9.2 FUNDAMENTALS OF THE SHIPPING AND OFFSHORE INDUSTRIES

For a variety of reasons the world's oceans play an essential role in the international petroleum industry. Oil and gas resources are invariably located far from the largest markets and shipping often represents the most economical form of transportation for these materials. In addition, the industry soon discovered that reserves of gas and oil exist underneath the sea bed. Exploiting these resources required the development of new technologies for offshore exploration and production. The shipping and offshore industries thus represent a critical element of the petroleum industry value chain.

9.2.1 The Petroleum Shipping Industry

Ships are used to transport a wide variety of petroleum products and raw materials. Petroleum shipping is a complex sector in its own right and the following discussion will provide only a brief overview of the more notable features of the industry.[1]

Vessel Types

There are many different types of vessel used to transport material in the oil and gas industry. The basic characteristics of a vessel depend on whether it is designed to carry crude oil in bulk, refined products or more specialist cargo. Vessels for the bulk transport of crude oil, known as tankers, are normally

1. For more detailed information on petroleum shipping refer to Tusiani (1996).

classified by size measured in deadweight tonnes (dwt).[2] Although there is no standard tanker size classification system, the following size classes and terms are widely used in the industry:

- *Greater than 200,000 dwt*: These are the largest vessels and are normally called ultra large crude carriers (ULCC) or very large crude carrier (VLCC). The use of these large carriers is often constrained by the ability of ports, seaways and infrastructure to accept them.
- *120,000–200,000 dwt*: These are medium-sized vessels and are normally called Suezmax. The smaller size allows these vessels to be more widely employed.
- *80,000–120,000 dwt*: These vessels are normally termed Aframax and are for medium or short haul trades.
- *50,000–80,000 dwt*: These vessels are normally termed Panamax and are often used as product tankers.

Ships are also used to transport refined products, the sea-borne trade of which is necessary for several reasons. Firstly, product carriers are required to transport finished product from export refineries to overseas customers. A number of very large refineries located in oil producing countries have been developed to refine crude oil domestically and export the product. This trend is especially notable in the Middle East and creates an obvious demand for product carriers. Secondly, the production from many refineries does not match the local market demand. For a particular refinery, some products are usually in deficit and some in surplus. A refiner may be able to export the surplus and import the deficit thereby stimulating trading activity which then requires product carriers.

Shipping refined products is, however, a more complex operation compared to crude oil shipment. There are a greater variety of products and it is normally necessary to segregate the containment of these different products on-board ships. The size of the shipments is normally much smaller and hence product carriers tend to be in the Panamax size range and usually require more sophisticated equipment to enable them to handle more than one product type in a single shipment.

In addition to crude oil and product tankers, there are several other types of vessels required in the oil and gas industry. Highly specialised cryogenic tankers are an essential element of the LNG supply chain. These vessels need to be able to transport safely a large volume of liquefied gas at −161°C. The transportation system for LNG is highly complex and will be examined in more detail in Section 10.4.3. Special vessels and transportation systems are also required for carrying LPG, a mixture of gases which also needs to be liquefied. This can be achieved either by refrigerating the cargo or by storing under pressure, both of which demand complex systems and operations.

2. dwt or deadweight tonnage is a measure of the weight carrying capacity of a vessel and includes the weight of cargo, fuel, stores, ballast, freshwater and crew.

Furthermore, ships are also needed to transport a wide range of petrochemical products many of which have special requirements due, for instance, to particular hazards or unusual physical properties. Solid petrochemical products (such as bagged polyester chips) may be handled on more traditional bulk solid carriers.

All the different types of petroleum product can be transported in a variety of different environmental conditions. There is, for instance, a general classification of vessels for use in arctic-type conditions. It can be seen, therefore, that the shipping industry covers a wide range of activities, is a vital component of the petroleum industry and provides a highly flexible and efficient system for moving products around the globe.

Shipping Industry Organisation and Trends

Given that the world's oceans span the globe, shipping is unsurprisingly a highly international industry. There are, in addition, a variety of different types of organisation involved in building, owning, operating, financing and maintaining petroleum vessels. Traditionally, the major international oil companies controlled shipping operations as part of their integrated global businesses. Although the IOCs still control significant shipping fleets, a large proportion of petroleum trade is now carried out by independent shipping companies. Furthermore, the NOCs have also established significant shipping capabilities.

The petroleum shipping industry is well known for being highly cyclical with long periods of overbuilding and declining freight rates followed by capacity shortages and rising freight rates. Over the medium term, the industry is strongly influenced by movements in trade, the development of new trading routes, wars and the development of new technologies. The shift in demand to the emerging markets, and especially the Asian markets, has, for instance, resulted in a general increase in demand for a larger capacity, faster and more economical shipping fleet. In addition, the development of gas liquefaction technology has significantly increased demand for LNG vessel capacity. Huge sums have been invested in the last decade to develop the current fleet almost 200 LNG vessels. Currently, however, the petroleum shipping industry overall continues to suffer from over-capacity, historically low freight rates and losses. Furthermore, the costs of increased regulation on many aspects of petroleum shipping increase the challenges faced by the industry. As a result, investors and lenders have in the recent past taken a cautious approach to shipping finance.

9.2.2 The Offshore Oil and Gas Industry

Shipping is not the only offshore activity in the petroleum industry. Exploration for oil and gas offshore requires specialist geophysical technologies, most importantly the ability to undertake offshore seismic studies. An important component of the offshore industry is, thus the provision of vessel based seismic surveying. Once suitable locations have been found, exploratory wells need to be drilled and this activity demands drilling rigs capable of operating in deep water. A highly sophisticated fleet of drilling rigs is now in use world-wide, ranging from basic moveable platform, or 'jack-up', type rigs to extremely sophisticated drill-ships capable of drilling advanced wells in challenging offshore environments.

If a discovery is made, the resource appraised and a decision is made to develop the reserves then the necessary infrastructure needs to be developed. As well as the drilling and completion of production wells, processing, storage, export and other facilities are required to handle the various fluids produced from the reservoir. Conventionally a fixed platform would be built with the wellheads on the platforms and fluids exported (or 'tied-back') to shore for processing and storage. With deeper water further from shore and the development of new technology, however, more activities began to move offshore. The industry is now able to place wellheads on the sea floor, process and store the well fluids offshore, re-inject gases and so on without the need for pipeline transportation to shore. Projects developed in this way make use of sub-sea technology[3] (wells on the sea floor), floating production and storage vessels and the like.

Many different types of floating production vessels and offshore infrastructure are now commonly encountered in offshore oil and gas developments. Fixed platforms were initially used for offshore projects, but with developments moving into deeper water, floating production facilities have become the main solution for the offshore production. There are four broad types of floating production facility namely: floating production storage and offloading (FPSO) vessels, tension leg platforms (TLP), spars and production semi-submersibles. Currently approximately 160 FPSOs, 20 TLPs, 20 spars, 40 production semi-submersibles and 100 floating storage and offloading (FSO) vessels are in operation worldwide. As with all infrastructure projects in the oil and gas industry, the decision on which type of production system to deploy in a particular offshore project will ultimately depend on the comparative economics of the various options.

The challenges for lenders and investors in financing these developments are significant. Moving projects offshore adds another dimension to development and operational risk, and factors such as weather conditions, labour availability, environmental pollution and logistics usually make project risks even more difficult to manage. Many offshore development projects have run into significant delays and cost overruns and the costs of bringing projects to completion can be very significant.

9.3 SHIPPING AND OFFSHORE RISKS

Although offshore projects are exposed to similar risks compared to onshore projects, offshore risks usually have much greater impact. Working offshore is more difficult particularly given the higher risks to human life, the remote

3. Sub-sea technology usually refers to activities that are traditionally carried out onshore or on platforms but which are located underwater and make use of sub-sea engineering techniques. A sub-sea wellhead, for instance, is similar to an onshore wellhead but located on the sea floor rather than above water on a platform.

locations and the more extreme weather conditions. Offshore construction requires specialist skills and equipment and is also generally more expensive. Furthermore, below a certain depth direct human intervention becomes impossible and remote working is the only option. This increases the costs and complexity. In addition, the environmental impacts of marine spills, accidents and so on are much more difficult to control and manage.

It is not only the physical challenges that increase when moving offshore. In many respects, the shipping and offshore industries have their own unique economic characteristics. As already noted, shipping markets are well known for their cyclicality and volatility and economic risks in the shipping industry are high. The economics of the wider offshore industry is also impacted by the market trends in the shipping industry. The offshore and shipping industries share yards, contractors, operators and human resources and, as a result, economic factors in the shipping industry will influence the offshore oil and gas sector.

9.3.1 Charterparty, Market and Residual Value Risks

Established markets exist for many of the assets in the offshore oil and gas sector, especially tankers, rigs and other moveable vessels. These markets cover vessel hiring, new build and the second-hand purchase and sale of ships. Ships and tankers are usually hired on the basis of charterparties, the hire payments typically being referred to as 'freight rates'.[4] Rigs are hired on the basis of rig-rates. Many of the markets for ships and rigs are highly specialised and are organised on specialist exchanges.[5] Freight rates and rig rates are determined by the inter-relationship between the new build, second-hand, freight and scrap markets and are well known for being highly volatile. Forecasting freight rates and second-hand vessel values is thus a challenging task and, when financing vessels or rigs, lenders will normally expect to mitigate market risks as far as possible through long-term time charterparty arrangements with credit worthy counterparties. It may be difficult, however, to obtain charterparty commitments from counterparties which extend much beyond 10 years and certainly not as long as the life of the vessel (there are exceptions, one being the dedicated use of specialist vessels, such as LNG ships, to particular projects).

Many transactions in this sector therefore involve lenders and investors forecasting the earnings-potential, and hence value, of ships, tankers and rigs for the period following the expiry of any charterparty agreement. These end-of-term values are known as 'residual values' and are, in practice, extremely difficult to predict. A drilling rig may, for instance, be contracted for 5 years but could have a useful life (and hence earnings potential) for at least 20 years. A 5-year charterparty is unlikely to support significant debt-gearing in comparison to the

4. The freight rate or freight is the term used in the shipping industry to refer to the monetary amount paid by a charterer pursuant to a charter-party.

5. The Baltic Exchange is one of the largest and most importance sources of shipping market information and trading.

vessel cost and hence lenders will normally be expected to attach some residual value to the earnings-potential of the remaining 15 years of the vessel life. How much value lenders attribute to this residual term depends on a variety of factors including: the types and specialisation of the vessel, the historical volatility of relevant freight, rig and hire rates, charterparty extension options and so on.

9.3.2 Construction and Operational Risks

Offshore construction is a higher risk activity compared to onshore construction. Project design risks are greater given that additional considerations need to be factored into design decisions (waves, currents, wind conditions, additional stresses, sea-floor stability, foundation design, corrosion, safety and environmental protection and so on). In general, as much fabrication and commissioning work as possible is completed onshore. Completed elements are then transported to the offshore project location. The offshore installation of project facilities therefore requires greater coordination and is subject to additional delay and overrun risks. Furthermore, specialist equipment is normally required for installation, including heavy lifting barges, pipe-laying vessels, tugs and tow vessels and so on. An added complication is that new building of ships and offshore construction work will almost always involve the services of a shipyard. Shipyard capabilities for specific types of vessel or infrastructure are variable, and the risks associated with the selection of the most appropriate shipyard for a particular task are great, especially for high specification projects in the oil and gas sector.

Offshore operation also presents additional risks. Labour costs are higher and specialist equipment and procedures are required during the operational phase for transfer of people and equipment offshore. Given the high level of risk involved in offshore operations, governments are typically heavily involved in the regulation of the offshore industry. The costs of complying with regulations can be an order of magnitude higher than onshore compliance costs.

9.3.3 International Law and Political Risk

International law is essentially concerned with the relationships between nations and states. An important area of international law, which has particular relevance to the oil and gas industry, concerns ownership and sovereign rights over offshore areas and resources. Territorial boundaries are required in order to determine which country has ownership and authority over particular areas of the world. Delineating territorial boundaries in offshore areas can be extremely challenging and there have been many disputes between states over the exact position of maritime borders. The legal position of projects in offshore areas can thus be unclear and this presents risks to lenders and investors. Oil and gas discovered in a particular offshore area often significantly increases the strategic and economic importance of territorial delineation and disputes can become highly political even resulting in conflict. The impact of conflicts and disputes on the viability of a particular project can therefore be significant.

The United Nations Convention on the Law (UNCLOS) is an international treaty which attempts to provide a framework for managing state relations in maritime areas and provides a set of rules aimed at governing the rights of states over offshore areas. An important feature of UNCLOS is the establishment of zones which determine the particular rights of states over defined geographical areas. In summary, these zones are: the internal waters, the territorial zone, the contiguous zone, the exclusive economic zone and the high seas.[6] Despite UNCLOS, the exact legal status of shipping and offshore activities can be difficult to determine precisely, and protracted and complex disputes are common. Lenders and investors in the shipping and offshore sectors are thus exposed to another layer of risks that would not normally apply to onshore projects.

The shipping industry has a particularly interesting status under international law. Ships operate in all areas of the oceans and, as such, are subject to various legal and political regimes. In particular, ships operating on the high seas are not, in theory, subject to the jurisdiction of any particular state other than the flag state of the vessel. The status of vessels whilst in transit between ports is therefore in a state of flux. This has important implications in terms of control of activities, insurance, lender security, and the ability to enforce security.

9.3.4 Pollution and Losses

The world's oceans are environmentally sensitive and pollution from the oil and gas industry represents significant risk to marine environments. Water readily transports pollutants and discharges over wide areas. Furthermore, offshore oil and gas activities can have a seriously detrimental impact on marine habitats. The impact of oil spills on wildlife is well known, as are the harmful effects of pollutants once they reach the shoreline. There is, however, a much wider range of other environmental impacts that need to be understood. Dredging and marine construction activities can churn up sediments, noise and vibrations can impact animal life and drilling activities can produce toxic discharges. There are many examples in the shipping and offshore industry of accidents that have resulted in significant pollution and losses of vessels and equipment. These accidents at best involve significant clean-up costs and at worst the loss of human life and irreparable damage to ecosystems. When moving offshore, therefore, investors and lenders need to fully understand the extent of potential exposure to which their projects are exposed and how the risks are mitigated to an acceptable level. In certain circumstances offshore pollution and loss risks may be so large as to make projects unbankable.

6. The provisions contained in the UNCLOS convention cover a range of issues and involve a variety of complex rules and guidelines. For more information see http://www.un.org/Depts/los/convention_agreements/texts/unclos/closindx.htm

Because pollution risks are so high and the potential damages so severe, the offshore oil and gas industry is highly regulated. The relevant regulations are typically administered by national governments through specialist departments. In many areas, national governments are themselves subject to treaty level agreements and protocols that govern the nature of regulation and minimum standards which must be observed. A further complicating factor is that a large area of the world's oceans is effectively beyond the regulation of national authorities. Shipping and offshore activities in these areas are governed by flag states and relevant treaties. In an attempt to harmonise the environmental standards of the shipping industry, the United Nations International Maritime Organisation (IMO) has developed the International Convention for the Prevention of Pollution from Ships, known as MARPOL, which was adopted in 1973.[7] MARPOL is one of the most important international environmental conventions and covers a variety of areas, including oil pollution, spillage and discharges to the sea.

The financial liability of owners and operators of offshore assets and the ability to provide insurance against losses also needs to be addressed. Liability for pollution is generally determined by national governments although the industry has agreed to a number of protocols that limit liability in specific circumstances and jurisdictions. For individual projects it is important to understand the potential level of liability to which sponsors and lenders may be exposed. The level of insurance cover for pollution and environmental damage will also need to be assessed and the limitations on the value and extent of cover fully understood.

9.4 COMMERCIAL STRUCTURES AND CONTRACTS

The global shipping industry has developed a number of unique commercial arrangements that reflect the specialist nature of many shipping activities. The offshore sector has adopted many of these commercial arrangements from the shipping industry.

9.4.1 Charterparties and Related Agreements

A charterparty is a contract between a ship owner and a third party (charterer) whereby the charterer wishes to make use of a ship or vessel for a period of time. There are different types of charter depending on the duration for which the vessel is being hired and the specific hiring arrangements. Charterparties are not, however, unique to shipping and are also commonly used to hire other vessels, including rigs, offshore production and storage vessels and so on. Given that a charterparty is the main contract pursuant to which a vessel will earn income, lenders and investors take great interest in the terms and counterparties to these

7. For further information, see www.imo.org/en/About/conventions/listofconventions/pages/international-convention-for-the-prevention-of-pollution-from-ships-(marpol).aspx

contracts. Often the bankability of a particular transaction can turn on the specific terms of a particular charterparty.

The industry has developed a number of standardised contract forms. Relevant standard forms for the oil and gas industry include the Shelltime 4, BPVoy4 and BIMCO[8] charterparties. The exact terms of a contract are influenced, in particular, by the type of vessel being chartered, the goods or services being hired and the location of the vessel. The major terms commonly found in time charterparties include:

- *Vessel description*: The charterparty will include details of the vessel classification, registration, technical details and specification.
- *Hire charges and freight rate*: The charterparty will usually specify a rate payable on a daily basis. Provision will also be made for off-hire periods during which the vessel is not available to the charterer and freight rates are suspended (i.e., during dry-docking).
- *Trading limits*: The charterparty will specify the areas where the vessel can be employed. Trading limit terms have insurance implications and lenders will want to ensure that the charterparty and insurance cover are compatible with the intended trading routes for particular projects. This can be an important consideration for projects in difficult locations.
- *Term and termination*: The term and termination provisions of a charterparty will often determine the acceptability of the contract to lenders. Lenders will typically require the term of the charterparty to extend for at least as long as the tenor of the debt. This can be difficult to achieve in practice and lenders are thus often exposed to a degree of residual value risk in the shipping and offshore sectors.
- *Cargo*: The charterparty will usually include details concerning the type and nature of cargo, which the vessel is able to transport.

Charterparties are often used for non-shipping offshore infrastructure, especially FPSOs. This can create certain issues and challenges given that the terms of a charterparty have developed in the context of the sea-borne transportation services rather than the provision infrastructure capacity. FPSOs, for instance, spend most of their lives in fixed positions rather than in motion on the world's oceans. The operations and maintenance requirements will therefore be specific to the particular asset (dry-docking, for example, is less relevant in the context of an FPSO charterparty). Specific provisions for operations and maintenance will thus need to be included in an FPSO charterparty. In addition, the crewing requirements for an FPSO will be very different compared to, say, a crude oil tanker.

There are other forms of charterparty that are encountered in the offshore oil and gas industry. One of the more important and potentially high-risk contracts is the drilling services contract. There are a wide variety of offshore drilling rigs

8. There are a variety of publications which cover various aspects of different standard form charterparties. Bundock (2011) includes full versions of a number of these standard forms.

and various ways of hiring rigs and rig services. The commercial arrangements between the various parties involved in drilling and completing an offshore well can become extremely complex. Different parties are typically involved in designing the well, drilling the well, cementing and completing the well, well-testing, logging, directional drilling and so on. The exact scope of work and responsibilities for each specialist task will need to be provided in the contract. Furthermore, the commercial terms for rig hiring and the determination of drilling rig rates can be complicated and often tailored specifically to the particular requirements of the project. Given the complexity of drilling offshore wells, day rates as opposed to fixed prices are more common in drilling contracts and rig charterparties.

9.4.2 Shipbuilding Contracts and Offshore Construction Arrangements

Shipbuilding contracts set out the relationships between the parties to a newbuild shipping project. These contracts are also relevant to ship conversions and other newbuild contracts for offshore vessels and equipment including drilling rigs, drill ships and FPSOs. Although shipbuilding contracts share many features with other types of construction contract, given the particular characteristics of the offshore industry, these types of contract usually include a number of unique features.

There are a variety of standard form shipbuilding contracts which can be used as the basis for negotiations between the parties. The most common standard forms are The Shipbuilding Association of Japan (SAJ), Association of West European Shipbuilders (AWES) and BIMCO Newbuilcon. Some of the more important terms of shipbuilding contracts are covered as follows.

- *Vessel specification*: The contract will include the detailed technical specifications of the vessel, such as speed, cargo capacity, fuel consumption, LNG boil-off, loading and unloading rates and so on. Vessel specifications will normally be examined in detail by the lenders' advisors as many of these parameters impact the overall project economics and interfaces with other commercial contracts.
- *Trials and acceptance*: The vessel specifications will normally be confirmed through various sea trials that will test the performance of the vessels. Once the trials have been successfully completed the buyer will accept the vessel and disburse the final payment instalments.
- *Price and currency risk*: Although shipbuilding prices are usually fixed and the shipyard bears the risks of cost overruns, in volatile conditions shipyards may ask for relief in certain circumstances, including, for instance, material price increases (i.e., steel) or exchange rate fluctuations.
- *Payment terms*: Shipbuilding contracts typically include standardised payment milestones based on particular events during the construction period (such as keel-laying and hull construction).

- *Refund guarantees*: The shipbuilding contract usually includes terms that allow the owner to claim a refund for payments made to the shipyard in the event the contract is cancelled.

Other terms commonly included in shipbuilding contracts cover: vessel classification, payment security, liquidated damages, delivery, performance guarantees and warranty periods.

Price, currency and payment terms of the contract are obviously critically important. Shipbuilding contracts are usually based on fixed prices which include hull construction, equipment installation, testing and delivery. It is becoming increasingly common, however, for fixed prices to be capable of variation in specific circumstances, including, for instance, increases in steel prices or currency movements. Payment is usually by instalments for specific milestones which typically cover: contract signature, steel-cutting, keel-laying, launching and delivery. Each payment usually represents an equal proportion of the total contract price.

Shipbuilding contracts normally include provisions for refund guarantees. The guarantees are typically given by the shipbuilder to the buyer and guarantee the repayment of payment instalments in case the ship is not delivered. Refund guarantees are often an important element of the lenders' security package for financing of ships and vessel. It is thus essential that refund guarantees are satisfactory and that the wording of the guarantee allows the guarantee to be called in the necessary circumstances. The calling of refund guarantees can become an area of dispute in the shipbuilding process.

Contracts for other offshore vessels and infrastructure will typically include terms commonly encountered in shipbuilding contracts. The construction of new build FPSOs, conversions, drilling rigs, floating platforms will, however, require significant modification and customisation to handle the required specifications of the project. Shipyards and shipbuilders will normally perform a central role in contracts for offshore vessels and infrastructure. Processing equipment, topsides installation, mooring and control systems and so on will, however, typically be provided by specialist contractors. Shipyard and contractor alliances and joint ventures are common for these non-shipping type of projects and the contract terms will reflect the unique nature of work.

9.4.3 Marine Insurance and Vessel Classification

Insurance for shipping and offshore activities has many unique features and needs to be very carefully considered given the nature of the risks and the large sums of money usually involved. The extent of coverage and terms of cover vary significantly, especially when cover is being obtained from specialist marine insurance organisations. Compared to onshore facilities and infrastructure, in the offshore sector the chances of losing an entire asset are much higher. For larger and more sophisticated vessels the insurance market may not be able to absorb the financial consequences of a total loss event. The commercial insurance markets are also unlikely to be able to deal with the full consequences of pollution and environmental liabilities in the offshore sector.

Vessel classification is closely related to insurance. Ship and vessel classification developed out of the insurance sector as a method of ensuring that vessels were built and maintained to certain minimum standards. Classification societies were established to survey vessels and certify standards. Insurers would not cover risks unless a vessel had a valid classification certificate from a recognised society. In addition to insurance, vessel classification now performs a much wider role in the shipping and offshore sectors. Classification societies[9] provide design and consultancy services as well as being involved in technology, research, development and information services in all areas of the industry.

9.5 SHIPPING AND OFFSHORE ECONOMICS AND FINANCE

The shipping and offshore industries are essential components of infrastructure required to transport, store and process petroleum. The offshore sector shares much in common with other oil and gas infrastructure that has been covered in the previous chapter and very similar economic considerations apply to offshore oil and gas as to onshore. The economic aspects of offshore pipelines are, for instance, very similar to those covered for pipelines in general in the previous chapter. The following sections will, however, consider the economics and financing of ships, rigs and FPSO in more detail given that these three sectors have a number of unique characteristics.

9.5.1 Economics and Finance of Shipping

The economics of shipping is an extensive topic in its own right and the following paragraphs will provide only a brief and introductory overview of the more important aspects of this complex subject. In common with other markets shipping economics is concerned with supply, demand and pricing. In the case of shipping, pricing information is contained in freight rates. It has already been noted that the petroleum shipping industry comprises a number of different sectors and these sectors have different demand and supply characteristics. There is thus no single market analysis that can be applied to the whole industry. A further feature of shipping is the volatility of prices and the relationship of freight rates to an economic concept commonly known as the 'shipping market cycle'.[10] There are four phases of the shipping market cycle, namely troughs, recoveries, peaks and collapse. Although cycles are not unique to the shipping

9. The major classification societies today include Lloyd's Register, American Bureau of Shipping, DNV GL, Nippon Kaiji Kyokai and Bureau Veritas.

10. For a more detailed analysis of the economics and shipping and the shipping market cycles see Stopford (1997).

industry they do have particular features in shipping due to the interaction between the market for new ships, second-hand ships, the freight markets and scrap market. Freights rates should be sufficient to cover the cost of building new capacity but vary significantly depending on the type of vessel and the particular market being served. The demand and supply for particular types of ship determine the market rates for chartering and both supply and demand can be impacted significantly by long term changes in the pattern of trading for petroleum products. The increased demand for product carriers, for instance, will feed through into higher freight rates, increased profitability and newbuilding of vessels. Supply of product carriers should then increase to the breakeven cost level at which point newbuilding should cease.

It can be seen that the petroleum shipping industry is capital intensive and at certain points in the market cycle, significant investment is required to satisfy the demand for new capacity. Although the ability to finance these potentially high levels of investment is an important feature of the industry, lenders to the shipping sector are acutely aware of the volatility of freight rates and the ability of the industry to generate cashflows. Shipping finance is therefore a specialist sector, which is in many ways separate and distinct from project finance. Ship finance often involves lenders taking a view on longer-term freight rates and in certain circumstances the residual values of vessels. In addition, many shipping finance transactions involve complex borrowing structures reflecting the international nature of the industry. Transactions in the oil and gas industry that involve a significant element of shipping market risk are often likely to fall within the responsibilities of specialist ship finance teams in the various lending institutions rather than the project finance teams.

9.5.2 Economics and Finance of FPSOs and Drilling Rigs

The market for shipping is derived from the demand for transportation services. In contrast, the demand for drilling rigs and FPSOs is driven by the demand in the upstream exploration and production sector. The economic characteristics of drilling rigs and FPSOs are hence quite different compared to shipping.

FPSOs

The costs of an FPSO depend to a large extent on the nature of the field development. A modest second-hand tanker can be converted at relatively low cost to a vessel capable of processing and storing easy to handle fluids in benign offshore conditions. A larger specially built vessel operating in more severe environments with significant processing of oil and gas can be multiples higher. In addition, offshore project development can be challenging with cost overruns and schedule delays not uncommon.

The ability to re-use an FPSO on other field developments has been the subject of considerable debate. The useful life of a vessel may well exceed the production life of the field and it is natural for project sponsors to seek financing to match the life of the vessel in order to minimise annualised capital costs. The difficulty in raising debt finance for periods longer than the vessel charter is that lenders will be asked to take an element of residual value risk on the underlying vessel. Unlike other assets, including ships, however, the second-hand market for FPSOs is relatively undeveloped, largely due to the uncertainty of the costs of conversion, that may be required to utilise the vessel on other fields. There is very limited track-record and experience in the re-deployment of FPSOs and hence it is extremely difficult for lenders to assess the level of risk to which they are exposed.

Drilling Rigs and Drill Ships

Drilling rigs and drill ships vary significantly in specifications and costs. There is a range of different types of vessel, the most common being semi-submersible vessels and drill ships. Furthermore, there is no single type of semi-submersible or drilling ship. Semi-submersible vessels tend to be categorised in six different classifications depending on a number of key specifications, including: drilling depth, power output and so on. There are advantages and disadvantages to each. Semi-submersibles tend to be more stable and, given that they do not require full-time shipping crew, tend to have lower operating costs. Drill ships, on the other hand, are cheaper to mobilise and have greater mobility.

The categorisation and specifications of drilling rigs and ships is important as it will ultimately determine the market within which the rig is operating and hence the rig rates that the vessel will be able to earn. Given that drilling programmes for specific projects usually extend for relatively short periods compared to the life of the vessel, it is typically difficult to ensure that a rig is hired for anything longer than 5 to 7 years. This again creates a problem with mismatch between the length of contracted revenues to the life of the project. Rig rates are notoriously volatile and depend to a large extent on oil prices through the mechanism of exploration and appraisal budgets. The ability to obtain suitable rig rates at the end of the initial contract is difficult to predict. Lenders to a rig financing will hence usually take a conservative view on the level of residual value risk and hence debt levels for rig financings are often comparatively low.

Chapter 10

Natural Gas and LNG

Chapter Outline

10.1 INTRODUCTION

The natural gas industry differs from the oil industry in a number of important ways. The physical and chemical differences between gas and oil mean that the storage, handling and transportation of gas are much more challenging compared to oil. The consequences of this are a less flexible supply chain and significantly higher infrastructure costs. The aim of this chapter is to look in more detail at the natural gas industry and, in particular, explain the concept of the natural gas 'chain'.

Section 10.2 introduces the concept of the gas chain and the linkages between each element in this chain. An important trend in the gas industry over the last two decades has been the enormous growth in the trade of LNG. The LNG business has its own unique supply chain characteristics and these will also be covered in this section.

Section 10.3 looks at the major risks in the gas industry that are of relevance to project finance. The close linkage between the components of a gas project means that risks have a tendency to be connected and amplified throughout the supply chain. When considering projects in the gas industry, project lenders will thus need assurance that the risks are consistently mitigated from the wellhead to the final consumer.

Section 10.4 describes the commercial arrangements for gas projects. Given the long-term nature of the industry, the dedicated nature of infrastructure and the issues of security of supply, the contracts between buyers and sellers tend to be long-term and involve significant financial commitment. The ability of the various participants in gas projects to honour their contractual commitments will thus be a primary concern of project lenders.

10.2 FUNDAMENTALS OF THE INDUSTRY – THE 'NATURAL GAS CHAIN'

Natural gas has become an important source of energy and now accounts for around a quarter of total energy consumption (see Section 5.2). Furthermore, natural gas and its by-products are important raw materials for the petrochemicals industry. The physical nature of natural gas means, however, that the infrastructure required to transport, store and process natural gas into products for final consumption is more complex and capital-intensive compared to other energy sources. This highly integrated supply system is commonly termed the natural gas chain and each element of the chain, from gas extraction and processing to storage, transportation and distribution, is organised as part of a carefully designed system.

10.2.1 Crude Oil and Natural Gas Compared

Crude oil and natural gas share many characteristics. Both are found in sub-surface reservoirs and originate from the same organic source rocks. Both have variable compositions of hydrocarbons and derive their value mainly from their use in the fuels sector. Despite these similarities, however, the characteristics of the oil and gas industries are fundamentally different with consequent impact on projects in several important ways, including capital costs, marketing, prices and revenues, technical and reserves risks and supply chain risks.

The Chemistry of Natural Gas and Differences Between Gas and Oil

Both natural gas and crude oil are complex mixtures of different-sized hydrocarbon molecules together with varying proportions of non-hydrocarbon components. The physical processes for forming, accumulating and storing natural gas and crude oil in sub-surface reservoirs are virtually identical. It is, in fact, very rare to produce crude oil without some associated gas. In comparison to crude oil, however, natural gas contains a greater proportion of lighter hydrocarbons particularly hydrocarbon gases from methane to butane. Various terms are used to describe the different components of natural gas and some of the more common terminology is summarised in Figure 10.1.

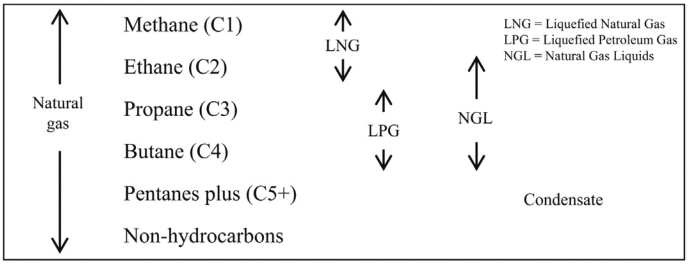

FIGURE 10.1 Terms used to describe different components of natural gas.

The proportions of the various components of a natural gas stream will determine the physical properties of the gas and will often have a strong influence on project economics. High proportions of non-hydrocarbons can, for instance, significantly increase project costs due to the requirement to install additional equipment to condition raw natural gas to pipeline quality and remove unwanted components.

The differences between the oil and gas industries are almost entirely due to the challenges in handling gaseous material compared to crude oil in a liquid state. Transportation and storage of natural gas is more difficult and expensive compared to crude oil. The cost of developing new infrastructure for natural gas projects is significant, especially in undeveloped areas with limited existing infrastructure. Natural gas marketing is also more complex and access to markets is a critical element of project planning and development. An important concept in this regard is 'stranded gas', which is gas having been discovered but for which no viable economic access to markets exists.

10.2.2 Components of the 'Gas Chain'

The main components of the gas chain are described in the following sections.

Exploration and Production

Although natural gas exploration and production is very similar to crude oil, there a number of unique upstream natural gas industry features. Because gas is much more mobile in reservoir rocks, the recovery rates for natural gas tend to be significantly higher compared to oil and the producing wells normally produce at plateau rates over longer periods. The owners of gas resource have, as a result, tended to enter into longer term depletion style gas contracts pursuant to which all production from the reservoir is sold forward for the life of the field. These longer-term sales contracts mean closer relationships between gas buyers and sellers and should result in a more predictable revenue stream over the life of the project. As a result, in many ways natural gas projects are better suited to project finance compared to crude oil projects.

Gas Processing and Transmission

Natural gas processing is in essence the equivalent of crude oil refining. The objective of gas processing is to condition raw wellhead gas into sales gas that can be delivered to customers. Sales gas is predominantly methane and hence the aim of gas processing is to remove heavier components, water and impurities so as to produce gas of a quality suitable for transportation in pipelines. This process of extraction also results in the production of valuable by-products. Ethane is either removed from or kept in the gas stream depending on its value and the specific quality requirements of the gas. A gas with little ethane present is usually termed 'lean' whilst one with significant proportion of ethane is termed 'rich'. If extracted, ethane is typically sold into the petrochemicals industry. Propane and butane are known as liquefied petroleum gases or 'LPGs'. Condensates are hydrocarbon components, which are heavier than butane but exist in the reservoir in gaseous state. At surface conditions, however, these components exist in liquid state and are extracted from the gas stream as liquid products. Condensates are similar in many ways to naphtha and have a similar value hence their production is usually a significant economic benefit to projects.

Gas transmission involves transporting the processed natural gas at high pressures through long-distance pipelines. Because of the huge investment cost required to develop natural gas transmission infrastructure, the barriers to entry in this sector are high. Regulators are therefore concerned that owners of transmission infrastructure may act in a non-competitive fashion. The regulation of gas pipelines has already been covered in Chapter 8.

Storage, Distribution and Marketing of Natural Gas

The close dependency of each element of the natural gas chain means that storage plays an important role in the industry. Storage infrastructure provides capacity that can be used to smooth out fluctuation in the supply and demand. Balancing production and consumption volumes is important both to manage seasonal demand changes and short-term disruptions to gas flows. Gas storage is, however, more complex and usually much more expensive compared to oil. Gas needs to be compressed or liquefied to be stored and it is also much more difficult to contain effectively. Various methods are used to store gas, including depleted reservoirs, salt caverns and liquefied gas containers.

The distribution of natural gas to final consumers is a complex and capital-intensive business, the exact characteristics of which depend on the type of customer to whom the final gas is being sold. Ultimately, the viability of a particular natural gas project depends to a large extent on an accurate assessment of the ultimate market for the gas. Market demand projections will determine capacity requirements throughout the natural gas chain and hence the required investment and potential project returns.

Each component of the natural gas chain requires substantial investment in infrastructure, processing plant and so on. As a result, developing a new pipeline or LNG-based gas chain is typically an enormous and risky undertaking.

10.2.3 LNG and Other Technologies

The conventional route to realise the value of discovered gas reserves is through high-pressure pipelines to end-user markets. This is expensive and often not feasible if the gas reserves are too remote from infrastructure. There are, however, alternative methods of deriving value from natural gas reserves, each of which relies on particular technologies to convert processed gas from the wellhead to forms that are more easily and economically transported to the end-user.

LNG Industry

Gas liquefaction involves cooling gas to a temperature below its boiling point so that it can be stored and transported in its liquid phase. Very low temperatures (known as 'cryogenic' temperatures) are required and these temperatures are achieved through a complex set of industrial scale processes.[1] Once liquefied, natural gas can then be transported on special LNG carriers to destination regasification plants where the regasified product is delivered into pipelines and on to end-users. LNG therefore has a separate and distinct supply chain compared to the more conventional pipeline route to market.

Despite its high costs and the challenges of handling cryogenic material, the LNG industry has become an important component in the global gas industry. Since the first shipment of LNG was made from the United States to the United Kingdom in 1959, the volumes of gas traded in this form has grown to over 300 billion cubic metres per annum representing around 10% of the global gas market. The largest LNG exporters are Qatar and Malaysia and the largest importers are Japan and Korea. Plant sizes for LNG range from small-scale facilities capable of producing around 2 million tonnes per annum to the largest plants with multiple trains each able to produce over 7 million tonnes per annum. Much of the existing facilities and infrastructure in the industry have been funded using project finance techniques and LNG has been one of the most successful sectors in the global project finance industry. Project finance for LNG will be examined in more detail in Section 18.2.5.

Alternative Uses and Markets

Liquefaction does not change the chemical composition of the gas and hence the final product is still natural gas. There are, however, chemical conversion routes for natural gas which open up different market opportunities for owners of gas reserves. The petrochemicals industry will be covered in more detail in Chapter 11. In this section a brief description will be provided of some of the technologies that are available to convert methane into valuable products.

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1. In simple terms, the liquefaction of natural gas is achieved by employing relatively conventional industrial scale refrigeration technology. The natural gas is cooled by contact with a refrigerant in specialised low-temperature equipment. The refrigerant is in turned compressed, cooled and expanded in a refrigeration cycle which uses considerable amounts of power and utility consumption.

One of the major uses of methane is as a raw material to produce synthesis gas or 'syngas', which is a mixture of carbon monoxide and hydrogen.[2] Synthesis gas is used in the production of a number of important chemicals, including ammonia, methanol, and synthetic fuels. Synthesis gas is also an important source of hydrogen.

The process of converting natural gas into synthetic fuels is commonly known as 'gas-to-liquids' (GTL). This chemical transformation process starts with the production of synthesis gas, which is then converted through a complex chemical process known as 'Fischer–Tropsch' synthesis to produce a high quality synthetic crude oil or 'syncrude'. This syncrude is then further processed to produce a variety of high quality products, including diesel blending components, speciality waxes and petrochemical naphtha products. By converting natural gas into synthetic fuels, the GTL process allows owners of gas deposits to access the large global refined products markets and thereby represents a potentially attractive gas monetisation option. GTL is, however, an expensive industrial operation and the economics of any particular GTL project is highly dependent on the difference between the prices for natural gas and refined products. Technology and scale-up risks are also comparatively high. As a result, whilst project finance has been used for GTL projects, bankability of GTL risks is challenging.

10.2.4 Gas Markets and Prices

Once reserves of natural gas have been discovered a market has to be identified so that the volumes can be sold, or 'monetised', at an economic price. In contrast to the crude oil markets, gas markets tend to be much more localised and challenging to access. Significant discoveries of gas can thus remain unproduced, or stranded, due to the inability to economically access final consumers. As a result, monetisation of newly discovered reserves often starts with a market assessment study, the objective of which is to identify feasible monetisation options. Fundamental decisions may need to be made, including, for example whether the gas will be sold into a domestic market or exported. In addition, issues such as seasonal variations in demand and prioritisation of customers need to be considered. The decisions made at the early feasibility stages are critically important for project viability and will also define the investment requirements and financing needs.

The markets for natural gas broadly fall into the following four categories, each having its own requirements and characteristics.

- *Power generation*: Power generation has become one of the most important bulk uses of natural gas. Developments in gas turbine technology and

2. Although the chemistry of syngas production is not straightforward, it can be explained in relatively simple terms as the incomplete combustion of hydrocarbons due to restricted oxygen supply.

combined cycle configurations[3] have made natural gas an efficient and competitive fuel for generating electricity. Gas-fired power plants consume large volumes of gas and hence represent attractive opportunities for base-load gas monetisation projects.

- *Industrial*: The next largest users of natural gas tend to be industrial customers who use gas as a fuel for process heating or as a chemical feedstock. For some industries natural gas has particular advantages, including cleanliness for the food industry and controllability for the glass and ceramics industries.
- *Residential and commercial*: Domestic and small businesses use gas for space heating, cooking and so on. These users tend to consume lower volumes over much wider distribution areas. The infrastructure costs needed to service distributed users can significantly impact project viability.

Natural gas prices generally tend to reflect the particular characteristics of the industry and differences between the various types of market for natural gas. In contrast to crude oil, natural gas prices tend to be set at a local or regional level and significant price differentials can exist between different markets. In addition, investment in infrastructure for natural gas projects is often orders of magnitude higher compared to oil. As a result, buyers and sellers often need to have certainty that agreed pricing arrangements will last over long-term investment periods. Historically, therefore, natural gas pricing has tended to be bilaterally negotiated between buyers and sellers and often not publicly disclosed.

Despite the regionalisation of gas prices, global oil prices still have a significant influence on the pricing of natural gas. Gas is usually sold in competition with crude oil and oil products and hence gas buyers expect to pay a competitive price for the gas. Contract prices have thus traditionally been determined by reference to pricing formulae that include crude oil and oil product indexation factors. A typical gas price formula is provided as follows.

$$\text{Price} = P0 \times a\frac{\text{Crude oil}}{\text{Crude oil 0}} \times b\frac{\text{Fuel oil}}{\text{Fuel oil 0}}$$

A base price, $P0$, is specified in the contract and various indices applied to this base price in defined proportions. In this case, the base price is indexed to crude oil and fuel oil benchmarks. The factors a and b are used to weight the influence of the different indexation factors. The exact proportion will be specified in the formula (0.6 and 0.4 for instance). The calculation of the contract gas price is usually performed semi-annually or quarterly. Although the gas price will be strongly influenced by the oil price and product price indices, long-term gas contract prices are typically less volatile and lag oil price movements.

3. Combined cycle gas turbine, or 'CCGT' technology uses natural gas as a fuel to generate electrical power from gas turbines. The heat content of the turbine exhaust gases is used to generate high pressure steam that can then drive steam turbines for further generation of electrical power.

In more developed and liberalised gas markets benchmark gas prices now exist. These benchmark prices are based on gas trades in specific market centres or 'hubs', the most important being Henry Hub in the United States and NBP in the United Kingdom.[4] These hubs have become deeper and more established and, as a result, benchmark prices are now important reference points for longer-term contract prices.

10.2.5 Industry Structure and Regulation

The structure of the natural gas industry has traditionally been based around three main activities, namely production, transmission and distribution.

Producers → Transmission Companies → Local Distribution Companies

Gas producers produce and process gas to the required quality, gas transmission companies transport the produced gas at high pressure to the consumer areas and finally local distribution companies deliver low pressure gas to the final consumers. Given the very high capital investments required in the industry and the fact that gas infrastructure tends to be dedicated to particular uses, organisations operating in this industry often find themselves in a position to exert monopoly power in the market. Governments have thus tended to have significant influence and involvement in many aspects of the gas industry. State-owned organisations have, for instance, traditionally been heavily involved in national gas industries Even when not managed by government-owned entities, the various activities in the gas industry are usually subject to a significant degree of government regulation. Furthermore, gas prices are often subject to government controls, including wellhead prices, pipeline tariffs and end prices to consumers. Most governments also impose obligations on gas producers to deliver a proportion of gas to the domestic markets. This is known as a domestic market obligation (DMO) and, given that domestic sales are usually at controlled prices and ultimately in domestic currency, can be a contentious area in the development and financing of upstream natural gas projects.

In many developed gas markets the natural gas industry has evolved into a much more liberalised and market-based structure. Previously state-owned entities have been privatised, competitive market arrangements introduced and price controls lifted. In the United Kingdom, for instance, the previously state-owned British Gas was privatised in 1986 and the industry fully privatised in 1997. The UK gas industry is now based on liberalised prices and gas trading.

4. Henry Hub is an inter-state pipeline inter-connection point in United States, which is used by NYMEX for natural gas futures pricing (see www.sabinepipeline.com/HubOverview.aspx). NBP is the UK's National Balancing Point, which is a virtual pricing point for the whole of the UK's gas transmission system. (See www.ofgem.gov.uk/gas/wholesale-market/gb-gas-wholesale-market)

Similar liberalisation of natural gas markets has taken place elsewhere, including continental Europe and the United States.

It can be seen, therefore, that there is a wide variety of gas industry structures ranging from state-owned, vertically integrated and price controlled arrangements to liberalised market-based industries. The viability of gas projects is strongly influenced by the regulatory environment and industry structures. It is thus essential for lenders and investors to thoroughly understand the nature of the industry within which a project is being developed.

10.3 RISKS IN THE NATURAL GAS INDUSTRY

The natural gas industry is capital intensive and projects are often located in difficult political and physical areas of the world. In addition, due to a strong potential for monopolistic behaviour by market participants, government control in all elements of the value chain is often considerable.

10.3.1 Gas Market Risks

Gas market risks can be broadly separated into volume risks, price risks and credit risks.

- *Volume risks*: We have already seen that access to sufficiently deep markets for natural gas can be challenging. For a project to succeed, sufficient long-term volumes of gas need to be sold to base customers. For some gas projects, a single large power generation project has been the sole offtaker of the gas. In other cases, established domestic gas grids are sufficiently developed to offer relatively straightforward routes to sell large volumes of gas to utility companies and distributors. Whatever the circumstances, however, gas projects will only be viable if sales volume risks are minimised.
- *Price risks*: The gas volumes need to be sold at viable long-term prices. Many factors influence the long-term gas prices and the negotiations between parties to a natural gas contract are often protracted and difficult. Whatever pricing mechanism is agreed between the parties needs to be realistic and sustainable. Gas pricing is covered in more detail in Section 10.2.4.
- *Credit risks*: Gas contracts usually create long-term commercial relationships involving considerable monetary amounts. Assuming annual sales of 10 billion cubic meters of gas, then this is equivalent to approximately US$ 2 billion per year or US$ 40 billion over 20 years, an enormous sum of money. The credit risks associated with the length of time and sums of money involved in gas contracts are thus significant. This is a critical bankability issue for natural gas project finance and lenders to a project will spend a considerable amount of time analysing the credit worthiness of potential offtakers.

Overall, gas market risks are considered to be high and, given the extended time periods over which these risks exist, are difficult to mitigate

10.3.2 Gas Reserves and Supply Risks

Reserves risks in the upstream industry have been covered in Section 6.3.1 and apply equally to natural gas as they do to oil. In general lenders to gas and LNG projects will typically lend on the basis of proved reserves. Categorising gas reserves as proven involves additional challenges for natural gas projects. Although technical reserves may be relatively straightforward to prove, the additional challenges associated with accessing markets for natural gas resources can mean that reserves remain unproven. Unless viable gas contracts are signed and the project can demonstrate economically feasible access to markets then it is unlikely that the reserves will fall into the proven category. Furthermore, unconventional gas reserves are likely to involve additional risk considerations, some of which add considerably to the complexity of project risk analysis. The bankability of tight gas, coal-bed methane and other unconventional resources is still being questioned and will form part of the overall technology risk assessment undertaken by project finance lenders. Sponsors of unconventional projects will need to demonstrate that the proposed plans to develop the gas resources have a demonstrated track record.

Many projects in the natural gas sector are developed on the basis of gas supply contracts rather than being integrated directly with the upstream reserves. An LNG liquefaction project may, for instance, purchase feed gas from a third-party supplies rather than developing gas resources as part of the project. Gas supply risks in these circumstances are significant and project success will depend to a large extent on the capabilities of the upstream supplier and the extent of the underlying resource base. Naturally the project will have less control over the development of the gas reserves and hence the terms of gas supply and remedies for failure to supply gas will be significant factors when assessing the long-term viability of the project.

10.3.3 Environmental Risks

Natural gas projects involve large-scale industrial activities that usually extend over a wide geographical area. These activities can present potentially very high risks to the environment especially during the project development stage. Coastal areas may need to be dredged, onshore and offshore pipelines and facilities may need to be installed and disruptive drilling and completion activities undertaken. LNG shipping and regasification activities can also have a highly detrimental impact on the environment. Environmental risks in general will be covered in more detail in Chapter 12.

10.3.4 Gas Chain Risks

The interdependency of each component of the natural gas means that projects in one part of the chain will normally be impacted by risks in other parts of the value chain. Delays in the completion of a pipeline segment, for instance, will impact the schedule of upstream and downstream projects. In the LNG sector, delays to the liquefaction plant could mean that LNG vessels become stranded with no cargo available to transport. In this situation, ships delivered on time may need to be re-deployed and even sub-chartered for short periods. Furthermore, project delays may result in gas buyers needing to source alternative supplies at higher cost. The gas seller in such a scenario is likely to be obliged to cover the additional costs of alternative gas procurement. The more inter-dependency between each element of the gas chain, the greater the risks of disruption. A dedicated gas field supplying gas to a power plant is likely to suffer serious consequences from any delays in the development of the power plant. As a result, extensive risk assessment on all related elements of gas or LNG projects will need to be undertaken.

10.3.5 Other Risks

The development of large natural gas and LNG projects from the sub-surface all the way to the final consumer is usually an immense undertaking spread over a significant geographical area. Projects in this industry are therefore exposed to many common risks that impact any large infrastructure development project. The size and national importance to both the producing and consuming countries usually means that large natural gas projects have a strong element of political risk. In addition, for gas projects in countries which do not have an existing gas industry or established legal and regulatory frameworks for gas projects, the risks can be especially high. The natural gas and LNG industries are also exposed to completion and technical risks that can have a significant impact on project cashflows and ability to service debt.

10.4 COMMERCIAL STRUCTURES AND CONTRACTS

The viability of natural gas projects is dependent on robust commercial arrangements for the sale and purchase of the underlying natural gas resource. The high costs involved in the development of natural gas projects means that long-term contractual agreements for sale, processing and transportation of gas are usually required to make the investments viable.

10.4.1 Corporate Structures

A variety of corporate structures are used for projects in the natural gas value chain. The upstream component of gas and LNG projects may be developed on the basis of unincorporated joint ventures and separated from relevant midstream and downstream elements. The upstream joint venture partners may establish a dedicated gas marketing entity that is managed by the operator as part of the overall joint operating agreement structure. The operator could, in addition, be responsible for marketing gas and agreeing long-term gas sales contracts with end-users. Naturally this will require an experienced operator to ensure that project viability is not threatened due to poor management of gas sales and weak offtake arrangements.

Corporate Structures for LNG Projects

A variety of corporate structures have been adopted for the different elements of the LNG supply chain. The upstream element of an LNG project may be fully integrated (i.e., reserves development and gas liquefaction in the same corporate entity) or separated (i.e., gas liquefaction project will purchase gas supplied by gas resource owners). The LNG liquefaction facilities may be tolled by the upstream gas owners or the LNG buyers. A number of LNG liquefaction projects have been structured on the basis of gas supply from developed domestic gas markets rather than dedicated reserves. Many factors will influence the final organisational structure, including common ownership along the value chain, tax treatment of upstream and mid-stream, government requirements under relevant licences, concessions or production sharing agreements and so on.

LNG projects may be developed and operated as part of a wider LNG industrial development scheme at the particular location.[5] If significant gas reserves are available then multiple LNG projects may be developed over a period of time (often exceeding a decade). In these circumstances it will usually be more efficient to develop common infrastructure, which is shared between the various associated projects. This infrastructure may be owned and developed by a separate corporate entity under the control of the various projects or by a central agency possibly managed by a national entity.

10.4.2 Gas and LNG Sales Contracts

Gas and LNG sales contracts have many unique features which arise largely because of the underlying complexity of the natural gas industry and the fact that the parties to these contracts are entering into very long-term and high value commitments. These commercial agreements are, however, fundamentally important to the viability of a particular project. A natural gas or LNG project finance transaction will thus typically be underpinned by one or more long-term sales contracts which generate the cashflows to service the project debt.

There is no single standard gas or LNG sales contract and the specific terms of these agreements will vary depending on particular circumstances of the project. A contract for the sale of gas from an undeveloped gas field will typically need to support the upfront investment in field development and infrastructure. This type of contract is normally known as a depletion contract and will typically be long-term and make provision for the various phases of field development and production. In contrast, in developed gas markets, shorter-term gas sales contracts that are not dedicated to any particular supply source are commonly

5. The development of Qatar's LNG industry at Ras Laffan is an example of a wider multiple train LNG development scheme.

encountered. Most gas and LNG sales contracts for project finance transactions are long-term and typically cover the following key terms.

- *Parties*: The ability of the gas or LNG buyers to fulfil their obligations for the term of the agreement is obviously fundamentally important. A variety of different entities act as gas buyers, including state-owned national gas companies, gas and power utility companies, traders and subsidiaries of the major oil companies.
- *Quantity*: A gas or LNG contract will usually specify the annual volumetric contract quantity together with maximum daily delivery volumes. The buyer will typically be required to nominate delivery volumes on a daily basis. The exact quantities defined in the agreement will depend on the specific physical characteristics of the project and may vary throughout the term of the contract.
- *Reserves*: The gas buyer may require reassurance that the underlying gas reserves are able to support the contract quantities. Provisions for reassessment or recertification of reserves may be included in the contract terms.
- *Price*: A variety of gas and LNG pricing mechanisms are commonly encountered ranging from formula-based pricing with oil price indexation to hub-based benchmark pricing (see Section 10.2.4). Provisions to limit the impact of price movements beyond a certain range may be provided for in the contract, including floor price mechanisms. Given the long-term nature of many gas and LNG sales agreements it is common for provisions to be included allowing the parties to request pricing mechanisms to be reviewed at specified times and in certain circumstances. The exact terms of these price review clauses can be contentious and will be carefully reviewed by project lenders.
- *Take-or-pay provisions*: These provisions oblige the buyer to offtake a minimum quantity of gas or LNG and failure to do so results in the buyer paying for amounts not taken. The exact terms of a take-or-pay commitment can be complex and will usually allow the buyer to recover volumes in future periods and to make adjustments to take-or-pay quantities in certain circumstances. Take-or-pay provisions may not be legally enforceable in certain jurisdictions.
- *Quality*: Sales contracts will include detailed gas or LNG specifications[6] and make provision for off-specification gas.
- *Other clauses*: Contracts will usually include a variety of standard clauses covering areas such as: gas measurement, commencement of deliveries, termination, default and dispute resolution and force majeure.

Although in many ways similar to gas contracts, LNG contracts typically include certain additional provisions, particularly regarding the logistics of transportation and delivery. An LNG contract will need to clearly define

6. Typically gas pressure, heat content/calorific value/Wobbe Index, composition and maximum impurities levels will be specified.

responsibilities for shipping. In addition, the buyer and seller will need to ensure that the vessels offtaking and delivering LNG are technically compatible with the seller's export terminal and the buyer's receiving terminals. Furthermore, LNG sales contracts usually include detailed provisions regarding the ultimate destination of the LNG offtaken by the buyers. These 'destination' clauses typically restrict the buyer's ability to deliver LNG to specific end-markets. As the LNG markets have developed, however, there has been a general weakening of destination provisions and destination clauses are becoming less common.

10.4.3 LNG Shipping Arrangements

LNG ships are a critical component of the overall LNG supply chain. The commercial arrangements and contractual structures that underpin the shipping element of the LNG supply chain reflect the importance of this activity. LNG ships are large and expensive vessels and the cost of procuring these ships can represent as much as 30% of total project costs. It is therefore essential to ensure that the most efficient shipping strategy is adopted in order to minimise these costs. There are a variety of factors that need to be considered when assessing the costs and benefits of alternative shipping options. Firstly, a decision has to be made as to whether the buyer or the seller will be responsible for shipping the LNG. Secondly, LNG vessels can be dedicated to a particular project or managed as part of a global vessel fleet servicing a number of projects. Thirdly, a strategy will need to be developed for procuring any newbuild vessels and arranging vessel chartering with vessel owners. A variety of different factors will influence the ultimate decisions. Tax and accounting treatment, terms and availability of finance and the capabilities of particular parties will all be important factors in the decision-making process.

The LNG sales and purchase agreement will specify the party responsible for transporting the LNG. If the buyer is responsible for shipping then it will take delivery of the LNG from the seller on an FOB basis. The LNG sales and purchase agreement will include detailed terms to ensure that the buyer's LNG shipping arrangements are satisfactory. The LNG seller may, for instance, retain the right to be involved in decisions regarding the design and procurement of the LNG vessels. If the seller is responsible for shipping LNG to the buyer's receiving terminal then it will be delivering the LNG on a DES basis. Whichever party is responsible for shipping of LNG the vessels will need to be procured for the project. It is almost always the case that newbuild vessels will be procured for a project and a detailed sales and purchase agreement will need to be agreed with a reputable shipyard. Shipbuilding contracts for LNG vessels are based on the general shipbuilding contracts, which have already been introduced in Section 9.4.2.

Although now less common, the shipping arrangements for a number of early LNG projects were based on the ownership and financing of vessels by the project company. As the LNG shipping industry has developed and the fleet size expanded, it has become more customary to charter vessels. Charterparties for LNG vessels are based on the general form of charterparty for ships with enhancements for specific characteristics of the LNG industry (provisions for LNG boil-off,[7] condition of the vessel at the loading port and so on). A number of standard form contracts exist of which the ShellLNGTime1 has formed the basis for many LNG time charterparty agreements throughout the industry.

10.4.4 Contracts for LNG Regasification Terminals

LNG regasification terminals form an essential element of the LNG value chain and act as both storage and processing facilities consisting of berthing and unloading infrastructure, cryogenic storage tanks, regasification systems and gas export pipelines. Commercially, LNG regasification terminals share many characteristics with other oil and gas infrastructure projects. Regasification capacity is normally dedicated to long-term users pursuant to capacity usage or tolling contracts, the most important terms of which include:

- *Services*: Regasification services include regasification of LNG and delivery of conditioned gas, storage services, berthing and unloading services, utility supply and so on.
- *Capacity*: The capacity of the facility is usually expressed in terms of gas-send-out rates based on energy content of regasified and delivered gas or in terms of the volumes of LNG, which the terminal is able to accept.
- *LNG delivery and natural gas redelivery*: The agreement will include detailed provisions concerning the specifications of permitted vessels for delivery of LNG to the terminal. Natural gas redelivery rates and specification will also be specified (including pressure, temperature, composition, energy content, etc.). The redelivery specifications will be determined largely by the requirements of national gas infrastructure operators.
- *Usage fees and capacity fees*: Users will normally pay a capacity reservation fee by way of compensation for the services provided. The fee is generally calculated on the basis of a fixed component to cover fixed costs of the facility (including debt service) and a variable component for variable costs.
- *Payment security*: Users will normally either need to maintain a minimum investment grade credit rating or provide payment security in the form of, for instance, acceptable letters of credit.
- *Term and termination*: For project finance transactions will require long-term usage agreements, which extend for a term at least as long as the loan tenor. The ability to terminate the agreement should be restricted to exceptional circumstances and should include compensation provision, which as a minimum ensure that senior debt can be repaid.

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7. LNG is stored and transported at extremely low temperature and, despite highly efficient insulation, it is impossible to exclude ambient heat causing a certain amount of LNG to re-vaporise or 'boil-off'. Provision may be made to re-liquefy boil-off gas or use the gas as a fuel source.

There are a number of issues that can complicate the risk analysis of regasification projects for project lenders. Firstly, it is very rare for the full capacity of the terminal to be contracted by a single user. Multiple terminal users will mean that natural gas will be delivered as commingled gas and that careful scheduling will be required between all parties. Certain users may expect to be granted priority rights over other users, especially if they have committed to reserve a large proportion of the capacity. Secondly, regasification terminals are usually regulated by national authorities and will be subject to anti-monopoly laws, typically including third-party access obligations.

10.4.5 Other Commercial Arrangements

There are a variety of other commercial arrangements and contracts commonly encountered in the natural gas industry. The contracts and arrangements that could have a significant influence on the project cashflows will be of most interest to the project finance lenders. It is the purpose of this section to examine some of the more commonly encountered arrangements in more detail.

Expansion and Sharing of Infrastructure

It is already been explained in Section 10.2 that a distinguishing feature of the natural gas industry is the requirement to invest in substantial infrastructure throughout the whole natural gas chain. The initial sizing of infrastructure is one of the most important considerations when first designing the development of a natural gas project. It is often the case that developers of natural gas projects design the initial infrastructure with provision for future capacity expansion. This is especially the case for LNG projects where the initial liquefaction trains are relatively small compared to the size of the underlying resource.

A common feature of gas projects, and especially LNG projects, is the ability to reduce costs through the sharing of infrastructure. It may be assumed, for instance, that a gas province has the capability to process several trains of LNG and the future projections for infrastructure are based on a long-term development plan for all of the LNG trains. The initial project developers may, however, be considering a more modest project of one to two trains. It may make economic sense to build in expansion capabilities during the initial investment and then allow for sharing of infrastructure between several future projects. These sharing and expansion arrangements can, however, create significant commercial complexities. The funding arrangements for the initial infrastructure need to be considered. It is common, for instance, for a full field development project to begin with one or two LNG trains, which will then form the foundation for future expansions. A variety of infrastructure requirements will be needed (including, for instance, ports, storage facilities and so on) and investment in this infrastructure will usually be front-loaded. Arrangements therefore need to be made to fund the infrastructure requirements that are in excess of the initial projects being financed. The commercial and contractual structures for sharing of infrastructure will also need to be established. While there are many precedents for infrastructure sharing, if project financing is being used to fund the projects then the exact nature of the sharing arrangements will need to accommodate the requirements of the project finance lenders. The complexities that arise out of these sharing arrangements are not confined to the natural gas industry and are often encountered in other sectors of the petroleum industry value chain.

LPG, Condensate and Other Sales Contracts

Natural gas reserves usually contain a variety of other products, which can add significant value to a project. These products include the heavier components of natural gas such as ethane, propane and butane (which together comprise LPG), condensates and sulphur and are often sold pursuant to long-term sales contracts with a wide range of counterparties. These sales contracts will be an important element of the contractual structure for a project financing and lenders will want to understand the detailed sales arrangements for any additional products. The revenues generated by LPGs and condensates can be a significant component of a project's economic performance and hence lenders will pay particularly close attention to the sales arrangements for the projects.

Chapter 11

The Petrochemicals Industry

Chapter Outline

11.1 INTRODUCTION

The last five chapters have focused on the use of petroleum products as fuels, principally crude oil products for transportation fuels and natural gas for power generation. The utilisation of petroleum for non-fuel use has, however, become increasingly important, particularly the production of synthetic materials by the petrochemicals industry. This chapter aims to explain the key features of the petrochemicals industry and describe the risks that petrochemicals projects present to project finance investors and lenders.

Section 11.2 looks at the fundamental characteristics of the petrochemicals industry. This segment of the oil and gas industry is concerned with converting low-value by-product hydrocarbon streams into valuable materials. The products from the industry are used in a wide variety of applications many of which have become as important as petroleum fuels products.

Section 11.3 then goes on to examine the main risks that impact the performance of the petrochemicals industry. The competitive forces in the industry are strong and success relies on the ability to convert low-cost feedstocks for sale into the international market. Prices are highly volatile and hence the major risks in this industry relate to the sustainability of competitive advantage over long periods in a constantly changing environment.

Section 11.4 covers the commercial structures and contracts commonly encountered in the petrochemicals industry with a focus on the customary forms of sales and marketing arrangements.

11.2 FUNDAMENTALS OF THE PETROCHEMICALS INDUSTRY

The petrochemicals industry originally developed alongside refining and, as a result, petrochemicals projects share many features in common with refineries. One of the main goals of a refiner is to ensure that the output of refined products from a particular refinery closely matches market demand. Refiners are especially focused on satisfying the market demand for the three principle transportation fuels, namely gasoline, diesel and jet fuel. We have already seen, however, that crude oil is an extremely complex mixture of components. It is thus almost impossible for a refiner to exactly match market demand and, as a result, refiners often have difficulty finding viable markets for all the streams produced by fuels refinery. The industry soon discovered that distressed refinery streams might be used as low-cost feedstocks which, with the right chemical conversion technology, could be converted to useful and higher value materials. Hence the skill of the petrochemicals producer is to identify low-value by-product feedstock from the fuels industry and convert these to higher value products.

Although the petrochemicals industry began as a result of the mismatch between crude oil processing and fuels market demand, many petrochemical products have now established markets of their own. In addition to distressed refinery streams, with the growth of natural gas processing, significant volumes of low-cost feedstock have become available from the gas industry. Furthermore, the petrochemicals industry has been able to produce a range of high-value fuel additives that are routed back into the fuels side of the industry. The relationship between refining, natural gas processing and the petrochemicals industry is thus highly sophisticated and the dividing line between the fuels and the petrochemicals has become less clear cut.

11.2.1 Raw Materials and Petrochemical Building Blocks

The feedstocks for petrochemicals are sourced from the crude oil refining and natural gas processing industries. These feedstocks are firstly used to produce seven basic petrochemical ‘building blocks’. These building blocks are further processed into a wide range of different intermediate chemicals and then finally converted to end-use products. The conversion of feedstocks into final products is illustrated in Figure 11.1.

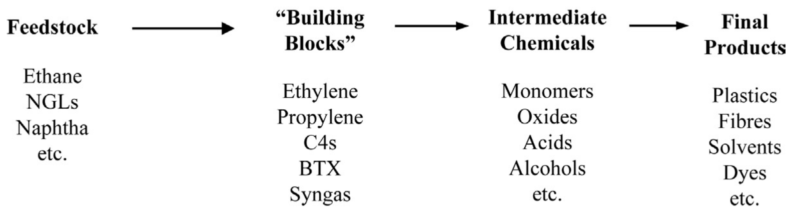

FIGURE 11.1 Conversion of feedstocks into final products.

Through these processing steps the petrochemicals industry now produces an astounding variety of different materials ranging from everyday plastics through to speciality pharmaceuticals. It is the chemical characteristics of hydrocarbons, particularly the ability of carbon atoms to link together to form larger molecules[1] and the ingenuity of chemists that result in the versatility of this industry.[2]

Although most petroleum fractions from refining and gas processing can be used as raw materials for petrochemicals, the most common feedstocks are ethane, propane, the C_4s,[3] and petrochemical naphtha. These feedstocks are then typically processed through petrochemical cracker plants or aromatics units to produce the seven basic building blocks grouped into three categories (1) the three olefins,[4] namely ethylene, propylene and the C_4 olefins; (2) the three aromatics,[5] namely benzene, toluene and the xylenes and (3) synthesis gas.

- *Olefins*: Ethylene is the highest volume basic petrochemical building block and is the raw material for producing many products, including polyethylene, polyvinyl chloride, polystyrene, and polyethylene terephthalate. Propylene is the second highest volume basic petrochemical building block and is used to produce polypropylene, propylene oxide, polyurethanes and nylon. The C_4s refer to butadiene and the normal and

1. The chemical binding together of atoms to form molecular chains is known as 'catenation' and carbon is unique in its versatility to catenate. The branch of chemistry that is principally concerned with the chemistry of carbon is known as 'organic chemistry'.
2. It is not the intention of this text to provide an in-depth commentary covering the chemistry of petrochemicals manufacturing. For further information readers should refer to specialist textbooks. See, for instance, Matar and Hatch (2001).
3. The term C_4 is used to refer to hydrocarbon molecules that possess four carbon atoms bonded together with hydrogen. Butane, iso-butane, butenes, iso-butenes and butadienes are the common C_4 chemicals.
4. Olefins are also called 'alkenes' and are hydrocarbons which contain double-bonded carbon atoms.
5. Aromatic compounds are hydrocarbon molecules which are based on a delocalised ring-shaped molecular structure.

iso-butenes. These building blocks are used for a variety of purposes, including for the production of synthetic rubber, thermoplastic elastomers and octane fuel additives.

- *Aromatics*: Aromatic hydrocarbons[6] are molecules containing a particular configuration of carbon bonds that are arranged in a ring-type structure known as a benzene ring. Benzene is the most important aromatic petrochemical and is the raw material for polystyrene, nylon and polyurethanes. Toluene is mainly used to produce polyurethanes and phenol. There are three significant xylenes, namely para-xylene, ortho-xylene and meta-xylene. The most important of these is para-xylene, which is the primary building block for polyethylene terephthalate used as a plastic especially for bottling.
- *Synthesis gas*: Synthesis gas, or syngas, is a mixture of hydrogen and carbon monoxide used as a source of several important chemicals, including hydrogen, methanol and ammonia. Synthesis gas is also used to produce synthetic fuels using Fischer–Tropsch technology. This technology forms the basis of the GTL conversion process, which was introduced in the previous chapter. There are a number of different routes to produce synthesis gas, the two most common being partial oxidation (reacting hydrocarbons with limited oxygen supply) and steam methane reforming (reacting hydrocarbons with steam). Both partial oxidation and steam methane reforming are highly adaptable reactions and can produce synthesis gas from a variety of different feedstocks ranging from natural gas to fuel oils and even coal. Synthesis gas is even produced from municipal waste.

These building blocks are used to produce a variety of intermediate and final products. These will be examined further in the next section.

11.2.2 From Building Blocks to Final Products

Final petrochemical products are produced by chemically transforming the basic petrochemical building blocks and intermediates using a variety of different chemical reactions. Although many reaction processes are employed to produce final products, a relatively small number account for about 80% of the industry's output. The following is a brief summary of reactions commonly found in the petrochemicals industry.

- *Hydrogenation and dehydrogenation*: The addition and removal of hydrogen to hydrocarbon feedstocks. An example of a dehydrogenation reaction is the production of ethylene from ethane.
- *Oxidation*: Reaction with oxygen. Paraxylene, for instance, is oxidised to terephthalic acid, which is used to produce PET (for bottling).

6. The term 'aromatic' comes from the fact that many substances having structures that are based on benzene rings give off a sweet and distinguishing odour.

- *Polymerisation*: Reacting molecules together to produce long molecular chains. The polymerisation of ethylene to polyethylene is one of the most important examples of this reaction.
- *Isomerisation*: These reactions change the shape of molecules and are particularly important for increasing the yield of desired products at the expense of unwanted by-products.
- *Hydrolysis*: These are reactions, which take place with water.

The reactions that create petrochemical products usually require special conditions and expensive catalysts. Furthermore, the processes required to produce petrochemicals are large scale, highly integrated and consume significant amounts of energy. Large volumes of by-products are usually produced, many of which are hazardous and potentially threatening to the environment. The consequences of process upsets and accidents include hazardous and toxic releases, fires and explosions, wide-spread environmental damage and so on.

11.2.3 Petrochemical Products and Markets

The business of petrochemicals is driven by industry players seeking profitable opportunities to source distressed streams from crude oil refining and natural gas processing and turn these into value through innovative chemical processing. Profitable marketing opportunities for petrochemical products have traditionally arisen out of non-fuels uses, especially the production of synthetic materials. These materials are produced at lower costs and perform better than many naturally occurring materials. Petrochemical products have thus been able to displace natural materials in many applications. Production of petrochemical plastics and other materials now totals around 500 million tonnes each year, the most important products being:

- *Plastics*: For packaging, plastic bags, bottles, etc.
- *Synthetic rubber*: For tyres and similar products.
- *Synthetic fibres*: For textiles, fabrics, rope, etc.
- *Fertilisers and agricultural products*: For the food industry.
- *Dyes*: Used in a wide range of applications.
- *Surfactants and detergents*: For cleaning applications.

When considering the different types of petrochemical products it is important to understand the difference between speciality and commodity products. The technology for converting feedstocks into valuable products is not static. New technologies continue to be developed together with refinements and incremental advances to existing technology. As a result, petrochemicals products tend to follow a life cycle from speciality through to maturity and ultimately possibly even obsolescence. Speciality products tend to earn premium prices over the costs of production reflecting the value consumers are prepared to pay for the unique features of newly developed materials.

In contrast, commodity products tend to earn prices more closely correlated to production costs with sufficient profit margin to allow the highest cost producers to produce enough to satisfy demand. It is important to understand the particular point in time when the market for a particular petrochemical product moves from speciality into maturity. The long-term sustainability of any premium pricing for speciality products will have an important bearing on the viability of projects in the industry.

Given the competitive nature of the industry, product specifications, marketing, branding and research and development all play a central role in project viability. Lenders and investors to projects will thus analyse the marketing strategy and availability of technologies in order to justify the ability of the project to earn sustainable product prices over the long term. In contrast to many other sectors in the petroleum industry, the petrochemicals sector typically involves extensive marketing due diligence and even sophisticated brand and customer segmentation analysis.

11.2.4 Petrochemicals Industry Structure and Characteristics

The petrochemicals industry is competitive, involves significant technological innovation, is capital intensive and operates in a global product market. In terms of production volumes the industry represents approximately 10% of the total petroleum industry. On the basis of product value, however, the petrochemicals industry represents a larger share of the total industry, reflecting the higher value of petrochemical products compared to fuels.

Historically the industry evolved out of technological innovation in the developed industrialised economies. Until the last quarter of the twentieth century production of petrochemicals was concentrated in Western Europe, the United States and Japan. Over the last few decades, however, production in areas with competitively priced feedstocks has increased dramatically. New production capacity has been built in the Middle East and Asia. This new capacity employs the latest technologies on the largest scales with some of the cheapest available feedstocks and, as a result, has changed the competitive landscape of the industry. Many older facilities using higher cost feedstocks have not been able to compete and hence there have been site closures especially in the more established and mature European markets.

A variety of different organisations operate in the industry. There are specialist chemical companies which purchase raw materials to produce a wide range of commodity and speciality petrochemicals. The major oil and gas companies are also large petrochemicals producers and have been at the leading edge of many technological developments in the industry. In addition, the national oil companies have become increasingly active in petrochemicals production. The largest companies involved in the petrochemicals industry are shown in Table 11.1.

TABLE 11.1 Largest Companies by Sales (2014)

	Revenues (US$ billion)
BASF	79
Sinopec	60
Dow	57
Sabic	44
Royal Dutch Shell	42
ExxonMobil	39
Formosa Plastics	38
LyondellBasell	33
Dupont	31
Ineos	27

Source: Adapted from Chemical & Engineering News

It can be seen from Table 11.1 that many of the largest petrochemicals producers fall outside the traditional petroleum industry structure. This is a reflection of the specialised nature of petrochemicals manufacturing and the fact that much of the technical innovation in the industry has come from pure chemistry external to the oil and gas industry core activities. It is, however, also interesting to note that whilst the original industry was formed in the developed markets of Europe and North America, there is increasing representation from new industrial areas, including the Middle East and Asia.

11.3 RISKS IN THE PETROCHEMICALS INDUSTRY

The petrochemical and petroleum refining industries share many features and, as a result, many refining industry risks that have been covered in Chapter 7 are also relevant to petrochemicals projects. In addition, refineries and petrochemicals projects are often closely integrated particularly in terms of feedstock supply and shared infrastructure. At a fundamental level, however, refining and petrochemicals differ in certain key respects and the assessment of risks in these two industries thus needs to be approached in a different way. Petroleum refining is concerned with the bulk processing of crude oil for the production of transportation fuels and is a high-volume, low-margin business. In contrast, petrochemical manufacturing is concerned with the identification of distressed petroleum streams that cannot be sold profitably in the fuels industry and to which value can be added through chemical processing. The ability to identify low-cost raw materials and efficiently convert these to end-products is the key to the long-term viability of a petrochemical project.

As a result, the risks associated with competitive positioning in the global product market are often the most significant for project finance lenders.

11.3.1 Price, Market, and Competitive Risks

Petrochemicals are used in a huge range of consumer products and, as a result, demand for petrochemicals is strongly correlated to global economic activity. Industry prices are highly cyclical moving from peaks to troughs largely in phase with variations in general business cycle. To survive in this volatile environment, projects must be able to remain cost competitive during sustained periods of low prices. The most significant factors, which impact cost competitiveness, are summarised as follows.

- *Feedstock costs*: The cost of raw materials is one of the most important factors in determining the competitiveness of a petrochemical project. The availability of abundant low-cost feedstock can stimulate investment in completely manufacturing locations. Investment in the Middle East petrochemicals industry over the past few decades is a successful example of the impact that changes in feedstocks can have on the industry.
- *Economies of scale*: Unit production costs in the petrochemicals industry are highly sensitive to the scale of production. If cheap and abundant feedstock is available then to reduce costs, the largest feasible production facilities should be developed.
- *Location*: The location of a project impacts its cost competitiveness in a number of important ways. Costs of construction and operation are influenced by location. Development costs in established areas should be lower due to better infrastructure, existing supply base and local labour. In addition, projects located close to the target markets will enjoy lower logistical costs in access to those markets.
- *Process efficiency*: Technology will impact both the cost of processing feedstock and the value of production. More advanced technologies should reduce feedstock consumption and improve the quality of produced product.

The ability to compete as a low-cost producer is usually the most important factor in determining the long-term viability of a petrochemical project. For a particular product, there will be a significant number of producing plants, each having its own levels of fixed and variable costs. The cost of these plants can be represented graphically by plotting cost versus cumulative capacity. This is known as a 'cost curve' and gives a useful insight into the pricing and market dynamics for any one particular product. The highest cost producers are commonly known as 'laggards' and the lowest cost producers as 'leaders'. The interplay between market demand, leader and laggard production costs and utilisation rates has a strong influence on product prices. A leading plant should, for instance, be able to earn a return on investment (and service debt) even when the market is in a cyclical low. This has important implications for project finance given that lenders will usually seek assurance that their loans are being used to finance leader plants, as opposed to laggards.

11.3.2 Feedstock Supply Risks

The availability and cost of raw materials for petrochemicals production is probably the most important factor in determining the success of the project. The cost of raw materials strongly influences the cost competitiveness of a project. It is not surprising, therefore, that the risks associated with raw material supply are often the most important risks in the petrochemicals sector. In common with other projects, raw material supply risk can be broadly divided into volume and price risk. Firstly, volume risks are typically higher for petrochemicals projects due to the fact that petrochemical processes usually rely on upstream processing facilities which need to supply high specification feedstock. The petrochemicals industry has been able to profitably process a wide range of different feedstocks. Ethane, propane and heavier components from gas processing facilities have, for instance, driven the development of some of the largest new integrated petrochemicals plants in the Middle East. Feedstocks from refineries continue to provide a significant proportion of feedstocks to the petrochemicals industry. Many petrochemicals plants also source the basic petrochemical building blocks directly from producers. In these cases the petrochemical project will be taking the long-term performance risk of the underlying project that supplies the feedstock. Given that most of these supplies will be supplied on a dedicated basis, project finance lenders will spend a considerable amount of time assessing the underlying risks to which their project is exposed.

Secondly, the risks associated with feedstock prices are also high due to the cyclical nature of the industry and the fact that numerous factors can influence prices in the short term. The cyclicality of the industry means that lenders to a petrochemicals project financing will want to ensure that the project can demonstrate economic viability even when the product revenues are at historically low levels. This means that the feedstock cost will have to be highly competitive. Ideally the feedstock supply arrangements to a project should be based on a long-term fixed feedstock price. Many of the petrochemicals projects in the Middle East have been successfully financed on the basis of low, fixed price ethane feedstock. In practice, however, fixed prices are difficult to achieve for widely traded commodity feedstocks and hence the impact on project economics of variable (often formula) based pricing will have to be carefully assessed through rigorous economic analysis.

11.3.3 Completion and Technical Risks

All project are faced with a degree of completion risk and these will be covered in more detail in Section 12.3.3. There are, however, some special issues which need to be considered for petrochemicals projects. Firstly, petrochemicals projects vary widely in terms of size and complexity. Smaller projects can often be handled by a single contractor but for larger and more complex projects several contract packages are usually required for covering a range of activities. The risks associated with multiple contract packages are normally much higher due to the additional complexity of managing the interfaces between the different contractors.

Secondly, the petrochemicals industry in general utilises more complex technology in comparison to other sectors of the oil and gas industry and, as a result, the risks are typically higher. Project sponsors usually seek to employ leading edge technology in new projects and will often argue that leading technology improves plant competitiveness thereby avoiding the risks of obsolescence associated with established technology. This can, however, create challenges for project finance lenders as it is rare for lenders to accept anything other than proven technology when financing any project. This means that lenders will need assurance that the technology being employed by the project has sufficient track record in similar applications. The extent of scale-up, number of operating hours experience, dependence on unique catalysts, equipment or specialist expertise will all be important factors in assessing technology risks.

Thirdly, petrochemicals projects often involve interfaces with a variety of third parties, including feedstock and utility suppliers, port infrastructure projects, shared facilities and so on. The risks associated with non-completion or under-performance of third-party projects can significantly increase completion risks. Project interface risk is explored further in Section 12.3.3.

11.3.4 Environmental, Health and Safety Risks

In common with the other sectors of the oil and gas industry, the petrochemicals industry presents significant environmental risks to wider society. In addition, the chemical processes used by the industry and many petrochemical products are hazardous and present potentially serious health risks to wider society. The industry has a history, which includes catastrophic accidents, which have resulted in serious casualties and pollution. The evaluation of environmental, health and safety risks for projects in this sector is therefore as important as those for the other sectors in this industry.

11.4 COMMERCIAL STRUCTURES AND CONTRACTS

The most important commercial agreements in the petrochemicals industry include those covering marketing and offtake of products, the supply of raw materials and technology licensing. The agreements and the corporate structures for petrochemicals projects will be explored in the following sections.

11.4.1 Corporate Structures and Joint Venture Arrangements

Numerous petrochemicals project finance transactions have been completed for projects in locations with abundant raw materials and less developed industries.

Many of these projects have been structured on the basis of domestically incorporated joint ventures between local entities and foreign investors, the foreign investors usually bringing specific expertise in technology, marketing and so on. Unincorporated joint ventures are comparatively rare in the petrochemicals sector. The corporate structures can, however, be complex depending on the exact scope of the project. An important consideration in this regard is the extent of integration from raw materials processing to final product marketing and distribution. A fully integrated project will involve the processing (cracking, reforming and so on) of raw materials sourced from upstream oil and gas separation plants to produce the intermediate petrochemicals building blocks. These building blocks are then further processed into subsequent chemicals and finally into finished products. These basic industry activities can, however, be carried out independently and variations in corporate structures reflect the ability of the industry to separate out specific processing steps.

Further variations on the traditional single purpose project company structure include the sharing of processing facilities and third party supply of feedstocks. There are examples, for instance, of project finance structures where derivative projects have purchased ethylene feedstock from a shared cracker project. Feedstocks and products may also be transferred between various entities within an overall site. These different types of corporate arrangements are especially common when a petrochemicals project is being developed to process streams from a refinery project.

11.4.2 Sales and Marketing Arrangements

Petrochemicals products are used in a wide variety of final applications and these products are in general more complex to market, sell and distribute compared to the bulk commodity and fuels products commonly encountered throughout the rest of the petroleum industry value chain. The buyers of petrochemical products usually require the products to conform to specific physical and performance specifications. Buyers expect reliable, consistent and high quality product supply. The petrochemicals markets are, however, also competitive with many buyers and sellers handling similar products. Many products are comparatively easy to handle, store and transport and can thus be relatively easily traded between regions. The marketing of petrochemical products therefore differs in many important ways compared to product marketing in other sectors of the petroleum industry. Experience and competent marketing capabilities are therefore normally essential to the long-term viability of a project.

Various sales and offtake arrangements exist for long-term and short-term trading of petrochemical products. It is, however, unusual for buyers of petrochemical products to enter into long-term take-or-pay commitments and, as a result, marketing, agency or distribution type arrangements are more common. These arrangements usually involve an experienced marketing organisation agreeing to manage the distribution and sales of product into the wider market. A marketer, sales agent and/or distributor will be appointed to arrange for the sales of specified products to third-party buyers and take delivery of product from the project for distribution to the final customers. The marketer will sell product to buyers on the basis of marketing and sales plans that will typically be agreed between the seller and marketer. These plans usually include estimated sales quantities in the agreed final markets, anticipated production and delivery schedules, target pricing and so on. The pricing provisions are normally based on 'net-back' pricing whereby the agent pays to the producer the final selling price less agreed costs (including freight, insurance and so on). A marketing fee is also charged based on the final sales price.

It is often the case that one of the joint venture partners is appointed as marketing agent, invariably the foreign partner providing related technology to the project. Tension can develop between the joint venture partners particularly regarding the level of marketing fees and the agreed deductible costs for the net-back calculation. The local partner may, for instance, expect the project company to take full management of product marketing once an initial build-up period has expired. The local partner may also insist that certain territories are not subject to the marketing arrangements but instead that the project takes responsibility for its own product placement.

The pricing of petrochemicals is normally set through demand and supply market mechanisms and, as a result, crude oil and natural gas benchmarks are rarely used as price references in petrochemical sales contracts. Several organisations do, however, publish market and benchmark prices for a wide variety of petrochemicals products, the most common being Platts and ICIS.[7] These published benchmarks may be used to determine contract prices. As already noted, the most common pricing methodology encountered in project finance transactions is, however, the net-back pricing arrangement whereby a marketer or agent is tasked with earning the highest product prices from which sales, distribution and marketing costs are deducted to arrive at the final realised price for the project. Ensuring that the best price is actually obtained from the market on an arm's length basis is clearly a significant concern when sales arrangements are conducted on a net-back basis.

11.4.3 Feedstock Supply Contracts

We have already seen that the viability of petrochemicals projects is influenced to a significant extent by the availability of cheap feedstock. Feedstock supply agreements define the terms upon which a project will have access to raw materials and hence are of fundamental importance to projects in this sector. There are, however, a wide range of different types of supply arrangements and the specific terms of a feedstock supply contract to any particular project will need

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7. ICIS is a leading provider of petrochemical market information, including pricing data for over 100 different products. ICIS also produce a variety of benchmark prices together with the ICIS Petrochemical Index (IPEX).

to be carefully scrutinised. In addition, whilst supply contracts to petrochemicals projects are similar in many ways to supply contracts for other projects, there are additional important considerations that need to be addressed. Chemical processes are usually highly sensitive to the quality and specification of the raw materials and hence contract terms covering the quality of supply and liability for off-specification materials are particularly relevant.

Feedstocks for petrochemicals projects are typically sourced from a dedicated supplier and hence the term of the contract and termination provisions will often be much more important for a petrochemicals plant compared to a refinery. The price of feedstock may also be difficult to negotiate given that there may not be a direct market-price basis for the feedstock supply. The seller of the feedstock may insist on take-or-pay provisions in the contract to protect its investments in supply facilities. This can obviously create significant issues for the project given that there are unlikely to be back-to-back provisions in any offtake contract. The risks relating to feedstock take-or-pay provisions will need to be carefully assessed to ensure that the project company will have sufficient funds to honour any payment obligations to the feedstock supplier in the event of disruption to the project.

Some projects have been financed on the basis of subordinated or deferrable feedstock supply payments. In more developed markets, feedstock may also be sourced from more than one supplier and a portfolio of different contracts may be entered into. The acceptability of these arrangements will obviously depend on the particular circumstances of the project.

11.4.4 Technology, Catalyst Supply and Similar Arrangements

The petrochemicals industry is fundamentally about employing chemical technology to add value to low-value petroleum streams. Access to competitive technology is thus an important consideration for any project in the industry and the viability of a project is often highly dependent on satisfactory technology transfer arrangements.

Technology Licensing

The most important commercial arrangement for the transfer of technology is the licence agreement pursuant to which one party, the ‘licensor’, grants intellectual property rights to another party, the ‘licencee’. Technology licence agreements are often vitally important contracts in petrochemical project finance transactions and hence it is necessary to understand the broad concepts of these agreements. The area of intellectual property rights and technology transfer is, however, complex and covers a variety of legal, technical and commercial issues. Although it is not the intention to examine this subject in detail,[8] the typical terms of technology licence agreements are summarised as follows.

8. A useful publication covering technology licensing in more detail is Parker (2002).

- *The grant of rights*: The particular rights transferred and the extent of transfer depend on the specific terms of the agreement. There may be restrictions on the use of the licensed technologies, sales of product and volumes of production. The agreement will also specify the arrangements for granting future rights to any improvements in technology and so on.
- *Royalties*: The licensor will normally expect to receive remuneration for the rights transferred through the payment of royalties. There are a variety of methods of calculating royalties, including fixed fee payments and payments based on production.
- *Technical information and assistance*: The type of technical information to be provided by the licensor and the method of supplying information needs to be specified in the agreement. Licencees will often require significant ongoing assistance from the licensor particularly during the design phase and plant commissioning and completion.
- *Performance, guarantees and testing*: The performance specification and guarantee levels are of fundamental importance to the viability of a project. The guaranteed performance levels will determine the technical assumptions in the financial forecasts and the testing regime for the general EPC contractors and any lender requirements.
- *Improvements and expansions*: The licence agreement will need to make provision for the exchange of information regarding any improvements to the technology during the life of the agreement. Normally both the licensor and the licensee agree to share information on technology improvements. In addition, the licence should stipulate the procedures for agreeing any requested production expansions during the life of the licence.
- *Term and termination*: Project finance lenders will obviously want to ensure that the licence agreement will extend for at least the period during which debt is outstanding. Given that termination of the licence agreement will have potentially catastrophic consequences for the project, lenders will want to ensure that the ability of the licensor to terminate the agreement is severely restricted and that the licensor enters into a direct agreement with the lenders.

Negotiating technology licence arrangements with third parties can become complicated and it is generally advantageous when one of the project sponsors acts as a technology licensor. Even if a sponsor is providing technology to the project, a number of challenging issues will normally need to be resolved. If the relevant sponsor sells its interest in the project then the status of the licence agreement can become problematic. The licensed technology may have initially been provided on advantageous terms to the project and the commitment of the project sponsor to provide ongoing support may be weakened following any dilution of interest in the project.

A further complexity that often needs to be addressed in petrochemicals projects is the relationship between technology licence providers and EPC contractors. The licensor usually provides a detailed design package, which is incorporated into the total facility design. This total design package will then form the basis of the scope of work pursuant to the relevant EPC contract. EPC contractors are usually reluctant to take design risk associated with proprietary technology and hence liability is often excluded for 'relied-upon technology'. This can be a particularly significant issue for project finance transactions given that licensors will usually accept only very limited levels of financial liability for design.

Catalyst Supply

Catalysts are essential in many petrochemical processes. In fact, innovation in catalyst technology has been one of the most important factors in the development of the petrochemicals industry. For individual projects, access to catalysts is often as important as access to raw materials and, given that many catalysts are proprietary, the arrangements for supply of catalysts need to be addressed at an early stage. Although in many cases, catalyst for a particular technology is readily available, for certain technologies the supply of catalyst is much more limited. It has been known, for instance, for catalysts to be available only from a sole supplier and even from a single manufacturing facility. Projects faced with these dedicated types of arrangement are exposed to additional risks, including the capability and capacity of the supplier to supply the catalyst, catalyst price risk and the risk of supply interruptions.

As a result, catalyst supply agreements may be vitally important to the viability of a project and will often be closely related to the associated licences for the underlying technology. The following terms are commonly expected to be included in such agreements:

- *Term of the agreement*: The term should ideally be for as long as possible. Short-term, renewable agreements (five years, for instance) are often encountered and these shorter periods can create challenges in project finance transactions. The acceptability of the term of the agreement will depend on the particular circumstances of the project and the ease with which catalyst can be procured from alternative sources.
- *Quantity*: The supply obligations should cover all of the projects requirements. There may, however, be limits on shipments and timing of supply.
- *Pricing*: Catalysts are usually sold on cost-plus pricing basis. Some catalysts can contain expensive components, especially precious metals, and the costs of these materials may need to be reported to the buyer on a regular basis to ensure that costs are controlled. The variability of catalyst costs can present material cashflow risks to projects.
- *Services*: Depending on the specific catalyst handling requirements, services may be required from the catalyst supplier. Catalyst storage, preparation and transportation may require specialist expertise.
- *Guarantees*: The catalyst supply may provide performance guarantees to the buyer. The monetary liabilities for performance failure are, however, often limited.

The terms of catalyst supply agreements and the inter-linkage between technology licences and other agreements can be complex. These arrangements are often critically important to the viability of a project and hence extensive due diligence will normally be undertaken by lenders and investors to ensure that the risks associated with catalyst supply are acceptable.

11.4.5 Other Commercial Arrangements

There are a variety of other commercial arrangements commonly encountered in the petrochemicals industry. Many of these arrangements are of fundamental importance to the success of a petrochemicals project and the long-term sustainability of project cashflows may be highly dependent on the contracts that underpin these arrangements.

Utilities, Industrial Gases and Other Supplies

Most petrochemicals processes consume significant quantities of various utilities, including electrical power, steam, cooling water and so on. Industrial gases and other specialist supplies are also often essential for the many projects. There are a variety of commercial arrangements that are commonly encountered in supplying these different inputs. A project could, for instance, supply the required utilities or supplies from self-generated sources. Power and steam can be generated on site within the project. Likewise infrastructure for cooling water can be built as part of the project. Alternatively, the project could purchase supplies from third parties as part of a wider distribution network supplying a variety of users. Power, for example, could be supplied through connection to a national grid. Many industrial plants are also often located in industrial zones that include centralised suppliers of industrial gases and services, such as cooling water or steam.

It is often more efficient to purchase the supply of utilities, industrial gases and other services from an experienced third party. Costs can be lowered through economies of scale and know-how. There are, however, certain disadvantages in purchasing from power grids or widely distributed networks. Given the fact that many consumers are being supplied from a single, common network, the reliability of supply is often lower. In addition, there is less control over the costs and prices of supply. An alternative and commonly encountered arrangement involves supply from a dedicated supplier on an 'over-the-fence' supply basis.

Various commercial and contractual structures can be employed but most will be based on some form of dedicated supply contract between the project company and a third-party project. A power and steam project may, for instance, be based on an agreement whereby the project company agrees to supply water to a utility separate project which installs boilers, turbines and other equipment to produce power and steam. This type of agreement is commonly termed an 'energy conversion agreement'. Likewise, industrial gases may be provided by a third-party project pursuant to various types of supply, capacity or tolling agreements. These types of third-party utility supply contracts can be complex documents covering many technical aspects of the supply obligations. In addition to taking the relevant supplies, for instance, the buyer may also be obliged to provide various utilities and services to the project company. The buyer may also be obliged to supply cooling water, fuel gas and so on, without which the third-party operator will be unable to provide the relevant services or utilities.

Many of these third-party supply projects are procured through a bidding process with the objective of obtaining the most competitive price for the supplies. Given that these utilities and supplies are often essential to the ongoing operation of the project, lenders will want to undertake significant due diligence to ensure that the supply arrangements are reasonable and that the third-party supplier has the necessary resources and experience to fulfil the supply obligations for the life of the loan. A number of other important issues also usually need to be addressed as part of the financing structure, especially if the third-party supplier is itself raising project finance debt.

Chapter 12

Project Development in the Petroleum Industry

Chapter Outline

12.1 INTRODUCTION

A defining characteristic of project finance is the extent to which lenders are exposed to project development and completion risks. Projects with high development risks and that fail to achieve completion are likely to run into severe difficulties in servicing debt. In short, without support the project company will almost certainly fall rapidly into bankruptcy. It is not surprising, therefore, that lenders pay particularly close attention to the risks of project delays, cost overruns and performance shortfalls. The purpose of this chapter is to explain the issues that need to be considered when approaching project development in the oil and gas industry. Closely related to the project development process are the completion risk mitigation measures that are often encountered in project finance transactions.

Section 12.2 provides a general introduction to project development in the oil and gas industry. Many projects in this industry are large, complex and situated in challenging locations. The risks to oil and gas projects of cost overruns and schedule delays are thus considered high compared to other sectors.

Section 12.3 looks at the project development process with a focus on the phases through which a development project passes and management of the activities in each of these phases. Given that the timing and progress of a project finance transaction are largely determined by the overall project development process, it is vitally important to understand the phases of project development and the factors which influence the performance of projects in each phase.

Section 12.4 then moves on to examine the various contractual arrangements commonly used to manage development risks. The importance of the various contractors is examined together with the methods used to manage these contractors. The approach to completion risks in project finance transactions is also covered in this section.

Finally, Section 12.5 considers the economic impact of the development phase on project viability. Cost overruns and delays can have significant impacts on the project economics and, in the worst cases, result in economic deterioration to such a level that projects are abandonment.

12.2 OIL AND GAS PROJECT DEVELOPMENT

We have already seen that merely to maintain the current levels of production, the oil and gas industry requires enormous investment. Continuous investment is essential to sustain upstream production as industry's finite resource base is ever more depleted. Likewise, midstream and downstream infrastructure requires investment to cope with ongoing changes in the industry supply and demand fundamentals. At the same time the oil and gas industry is highly competitive and to survive successfully firms must ensure that investment in projects is properly and efficiently managed. This means completing development projects on-time and within budget.

The risks to project completion manifest themselves in three main ways, namely: schedule delays, cost overruns and performance shortfalls. These three risks rarely, however, occur in isolation. A delayed project usually goes over-budget. Likewise performance shortfalls normally require additional time and money to rectify the underlying causes. It is useful, however, to consider each separately as finance structures are often developed so as to target each of these risk areas individually.

- *Cost overruns*: Cost overruns are usually the result of poor initial budget estimates perhaps due to design errors or to incorrect forecasting of cost inflation. It is rare for large projects to be completed without costs overrunning. Many projects exceed the initial budget by as much as 30% and cost overruns of over 100% are not unknown. The viability of a project subject to a doubling of costs is clearly thrown into significant doubt.
- *Schedule delays*: The original estimate of the time to project completion can be threatened by a wide range of factors, many of which are extremely difficult to foresee and to control. The global procurement of materials for a project substantially increases the risks of delay due to the potential impact of events over a much wider geographical area.

- *Performance shortfalls*: Projects often fail to achieve the required level of performance. This may be due to a technology failure, failure of a third-party supplier to provide the necessary quality of inputs or some other reason. Performance shortfall results in lower cashflows due to less efficient processing, poorer quality product and probably lower production volumes.

In comparison to projects in other industries, oil and gas project completion risks are especially challenging to manage. Oil and gas project development covers a highly diverse range of different types of activity. Projects are developed in all types of physical environments ranging from arctic to desert conditions. Project procurement is often global with equipment and material supplies from many different jurisdictions. The challenges of managing such a large and diverse supply chain are clearly significant. Disruption to project development and schedules can come from many sources. A strike at a distant shipyard, for example, can cause delays in delivery of equipment, which then impacts the overall project schedule. To add further to the challenges, timing of construction and procurement activities is often constrained due to specific factors, including, for instance, local weather conditions.

Development activities frequently need to be managed in parallel, often pursuant to a variety of different contracts with separate suppliers. In many upstream projects a drilling programme to pre-drill production wells will probably be running in parallel with facilities fabrication and pipeline procurement. Similarly, refineries or petrochemicals projects often involve the fabrication of reactor vessels by overseas suppliers running in parallel with foundation and site works on location. Global procurement and parallel activities require very careful logistical planning and supply chain management.

12.3 THE PROJECT DEVELOPMENT PROCESS

The development of a project is, in many ways, a unique activity. In contrast to manufacturing processes, projects are 'one-off' and transient in nature. Successful project development demands particular management and organisational skills. Project development teams are normally brought together for individual projects and exist for the limited life of the project. Large oil and gas projects can take several years to develop and once complete, development teams are usually demobilised and re-deployed. These characteristics and challenges of project management need to be recognised and accommodated in the project development process.

The risks that development projects present to lenders are also in many ways unique. Unlike corporate finance, lenders to projects do not have immediate recourse to valuable cashflows. It may, in fact, be several years before projects develop any cashflows at all and hence it is impossible for debt principal and interest to be serviced during the development phase. When analysing the credit risk of a development project lenders are thus effectively viewing a borrower that is verging on bankruptcy. As a result, much of the structuring of project finance transactions is focused on the mitigation of development risks to ensure that they are bankable.

12.3.1 Phases of Development

Most projects follow a similar process through the development period moving through an initiation phase, into a design and planning phase then an execution phase and finally into project completion. This process is illustrated as follows.

Initiation → Definition → Detailed Design → Procurement and Construction → Completion

Each phase involves increasing cost and resource commitment to the project. In the early phases the project definition is relatively vague and cost estimates highly uncertain whereas in the later phases the project becomes much more accurately defined. Changing the project definition becomes increasingly difficult as the project proceeds through the development phases. Although complications in project development tend to materialise towards the final stages of the process, these complications are invariably the result of decisions made in the initiation and definition phases. Project lenders usually have very little influence over early decisions but have to live with the consequences of those decisions. For project finance transactions it is thus important for all parties to understand the characteristics of the various phases of development and how the activities and decisions made in these different phases can impact the viability of a project.

Project Initiation

Projects usually begin when a particular opportunity or need is identified. Opportunities come about for many different reasons, including changes in market demand, discoveries of new resources, development of new technologies or changes in competitive environments. Political, legal or environmental reasons can also drive the initiation of new projects. Whatever the reason, once a need has been identified, the project then has to be justified. Moving into the next phases of development means commitment to additional costs. Project initiation will therefore involve some form of project proposal, a basic feasibility study and a request for funds to move into the project definition phase. Income and cost estimates at this stage will be highly uncertain but can be used to evaluate the attractiveness of different options. Commercial and financial aspects are unlikely to be given significant consideration at the project initiation stage although the need for and structure of joint venture arrangements may need to be considered.

Project Definition

The definition of a project involves narrowing down options, clarifying objectives and determining the scope, specification and characteristics of the project. A properly defined project will form the basis for successful design and ongoing project development. An important element of the project definition stage is the development of an engineering and design package. This is usually called 'front end engineering and design' or 'FEED' and forms the basis for soliciting bids from potential contractors. During the FEED stage, project sponsors will typically begin to consider bankability issues. Technology selection will, for instance, form an important part of the FEED study. If the project sponsors intend to raise project finance debt then the bankability of the proposed project technology will need to be carefully considered.

FEED packages comprise an extensive set of documentation describing the organisation of the project, basic engineering, process drawings, basic equipment specification, utility requirements, estimated costs and a preliminary project schedule. The FEED package will form the basis of contractor bids and will include draft EPC contract terms. The project sponsors will thus need to consider carefully any lender requirements that will need to be included in the draft contracts. It is advisable, for instance, to include references to direct agreements and any specific requirements which may need to be included to accommodate export credit finance. Ultimately the project sponsors will complete the contractor selection process, negotiate terms and finally sign the EPC contracts.

In addition to the EPC contracts, project definition stage activities will usually include the development of other commercial contracts. Negotiations will typically be initiated that will cover important commercial arrangements such as technology sourcing, product offtake and feedstock supply. Risk transfer and lender bankability requirements will in all likelihood need to be addressed during this stage of the project development process. In addition, as spending commitments start to increase, sourcing and structuring of funding for the project will become increasingly important. It is during this stage of the project that funding options are normally considered and decisions made on the appropriateness of project financing. If project finance is the preferred method of funding then financial close should ideally occur at around the same time as signature of the EPC contracts. Committed funding should then be available to meet the contracted EPC milestone payments. It can thus be seen that the majority of the structuring and negotiation of a project finance transaction will likely take place during the project definition phase.

Detailed Design

The results of the project definition phase are rarely sufficient to allow the selected EPC contractors to begin procurement and construction activities. Detailed design work is required to fully specify equipment and material requirements, undertake detailed hazard and environmental studies, develop detailed piping, control and instrumentation systems and so on. The detailed design phase usually results in a significant increase in expenditure and many sponsors contract this phase out to third parties. Detailed design work for projects in the oil and gas industry is often incorporated into the EPC contract scope of work.

Detail design will usually take place after financial close and drawdowns under the project finance loan agreements will be made to fund ongoing project costs. Lender involvement in this phase of project development is normally relatively limited. It should however be appreciated that decisions made during the detailed design phase often have a significant influence on the performance of the project in later stages. Lenders will therefore expect progress to be reported and monitored on a regular basis with input from the lenders, independent engineer.

Procurement and Construction

Once the design of a project has been sufficiently advanced, the procurement of the various project components can begin. Procurement activities include the identification of potential suppliers, the issuance of requests for quotations, the selection of the preferred supplier and the negotiation of price and terms of the supply contract.[1] The procurement task also involves the management of logistics to deliver particular components to site and provisions for inspection and acceptance of materials and individual items of equipment. The procurement phase can be complex and time consuming, particularly for large and/or complicated items of equipment. As the procurement phase proceeds, equipment and materials will be delivered to site and the construction of the project will start to move forwards. The construction phase involves all the activities needed to assemble the project, including site preparation, materials handling, erecting the structure of the facilities, installation of equipment, inspection and testing of the installed facilities.

The procurement and construction phases of oil and gas projects are complex and challenging. It is during this phase, however, that the majority of project costs will be incurred and funds invested in the project. In addition, the lenders to a project rarely have any meaningful control over the construction and procurement activities. This phase of project development usually continues for a significant period of time and often represents the riskiest phase of the project development cycle.

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1. For a variety of reasons, project sponsors may have to follow specific procurement procedures. The involvement of certain institutions may require project sponsors to follow particular procurement rules or guidelines. The World Bank, for instance, has issued guidelines for the procurement of goods and services, which apply to borrowers under various World Bank programmes. National and regional authorities (including the EU) may also impose specific procurement rules and guidelines (including minimum levels of local content), which project sponsors and developers need to comply with.

Commissioning

Commissioning of the project facilities is the final stage prior to the project entering into commercial operations. Commissioning activities include pressure-testing, equipment clean-out, checking the installation and mechanical performance of specific items of equipment, checking instrumentation and control systems and so on. A major goal of commissioning is to test the facilities to ensure that they have been constructed according to the original design and are capable of operating as planned. The commissioning phase can extend over several months or even up to a year and beyond depending on the complexity of the project. In addition, the major elements of a complex project are often commissioned separately and sometimes in parallel. This is especially common in offshore projects whereby a significant element of commissioning may be performed onshore prior to sail-away.

For large projects in the oil and gas sector, the commissioning phase can be highly complex and will invariably require careful planning. The commissioning period will often be the first time that flammable and hazardous materials are processed in the newly build plant. Furthermore, the division of responsibility between construction, commissioning and future operations teams can be unclear or improperly defined. The commissioning period is thus one of the highest risk points in the life of a project.

If project finance has been used to fund project costs then the debt outstanding to project lenders will typically reach a peak during the commissioning phase. Lenders will thus have maximum exposure to the project during this phase of development and project sponsors or other providers of completion support may be liable for significant monetary amounts in the event of cost overruns or completion delays.

12.3.2 Managing Project Development

The various phases of project development that have been described in the previous section, differ significantly in terms of resource requirements, management skills and external interfaces. Furthermore, the tasks and activities in each phase are highly diverse ranging from desk based design work through to the pouring of concrete on site. Managing project development involves coordinating and controlling a wide variety of human resources, usually spread over an extensive geographical area and often based in a number of separate organisations. Coordinating and managing the tasks involved in a large project development presents significant challenges, especially when projects are located in difficult environments. Large projects can involve the mobilisation of several tens of thousands of people. The construction activities in themselves may require the development of infrastructure such as roads for importing materials, port areas for offloading, work camps and so on. Furthermore, nearly all projects involve the employment of third party contractors to carry out significant elements of work. This is especially the case in the oil and gas industry where many specialist contractors are required for particular activities. The drilling and completion of a single offshore well, for instance, may involve the services of a variety of different contractors.

A standard system of organising and managing project development activities does not exist and there is no 'correct way' to solve the project management challenges. There are a variety of ways to organise project development activities each of which aims to reduce the development risks either by retaining the risks in-house or by allocating the risks to third parties through commercial contracts. A company may decide to carry out all project development activities itself from project design, engineering, procurement, construction, commissioning and completion. This may be feasible for small and simple projects but, as the size of projects increase, for larger projects it becomes less feasible to carry out all of these activities internally. At the other end of the spectrum a company may decide to contract out the whole project development process from early design stages through to completion of the final project. In this case the company would provide the specifications for the project and agree a price. The contractor would then design, build and complete the project and hand-over to the client. The client would still need to manage the contractor and would normally need to set up an in-house project management team to monitor progress and manage the interface with the contractor.

In practice, most projects fall some way in between. It is common for project sponsors to undertake some level of project design and, for these purposes, the sponsors usually engage an external contractor to manage the FEED work. This FEED contractor will prepare bid documentation that will include project designs and specifications together with the terms of the contractor to be entered into. A bidding process will follow and a contractor selected to sign the contract. In addition to the FEED contractor, the project sponsors will also establish a project management team to be responsible for delivery of the project. The project management team is normally staffed with members from the sponsors' own organisations and is tasked with ensuring that the project is delivered on time and to budget. The skills and capabilities of the project management team are often critical to ensure the successful implementation of the project. Furthermore, the requirements of the project management team evolve as the project progresses through the various development phases. Different skill sets are required, for instance, in the detailed design phase compared to those in the start-up and commissioning phases. As a result, the composition of the project management team may vary throughout the project development phase. This in itself creates management challenges that need to be properly addressed in the organisation and structure of the team.

Whatever system is adopted by the sponsors, project finance lenders will examine the proposed project management and organisational arrangements in detail. Lenders will expect their technical advisor to confirm that the arrangements are satisfactory and that the project management team have sufficient relevant skills and experience to undertake the project. Lenders will also expect project sponsors to provide project management assistance and skilled personnel. The terms of any relevant technical services agreements, secondment agreements and the like will be scrutinised by the project sponsors and their advisers.

A particularly difficult challenge in many upstream oil and gas projects concerns the delegation of project management duties to the operator. We have already seen that many projects are organised on the basis of unincorporated joint ventures and that one of the joint venture partners is normally appointed as operator. Responsibility for project management is typically delegated to the operator pursuant to a joint venture agreement. Given that the lenders have no direct contractual relationship with the operator, the ability of lenders to undertake detailed due diligence on the project management arranged is constrained. Lenders will also be able to exert a significantly lower level of control over project management in this situtation. Lenders are, however, often able to accept the project development risks provided that the operator is experienced and well known and that the terms of the unincorporated joint venture give the non-operators an acceptable level of control over the performance of the operator.

12.3.3 Nature of Completion Risk

Completion is probably the most important event in the life of a project and is especially significant for project finance lenders. It is only at the point of successful completion that a project is able to start generating sustainable cash-flows to service debt. Given the importance of completion it is not surprising to find that lenders spend a considerable amount of time assessing the risks associated with the completion of a project. Furthermore project lenders usually have limited control over the management of the project development process and are in a weak position to influence the direction of the project throughout its various phases of development. Ensuring that completion risks are acceptable to lenders can therefore be especially challenging and often creates significant frustration during the negotiation of a project finance transaction.

Factors That Influence Completion Risks

The degree of completion risk to which a project is exposed, and the lenders' views of these risks, will significantly influence the structure of a project financing. It is thus essential to understand the factors that determine the level of project completion risk and to assess these factors against the project being financed. A better understanding of the comparative level of completion risks will help determine the most appropriate approach to bankability and risk mitigation.

- *Size and complexity*: Large projects, which demand more financial and human resources, are more challenging to manage and control and normally involve more interfaces between a wider variety of parties. Complex projects generally require greater levels of management expertise to control the interfaces between all the interconnected elements of the project.

- *Project location*: The location of a project has a strong influence on the level of completion risk. Unusual or extreme conditions (arctic, deep sea, mountainous terrain and so on) will increase the likelihood of delays or overruns. The political and regulatory environment in a particular location can also significantly increase project development risks.
- *Technology*: It is generally more difficult to predict the costs, complexity and performance levels of new or unproven technology. As a result there is an increased likelihood that project completion will be delayed or budgets exceeded.
- *Interfaces*: Many projects in the oil and gas industry rely on third-party interfaces to achieve successful completion. Examples include third-party supply and utility projects, downstream infrastructure and so on. Project managers have less control over third-party projects, and the more the third-party interfaces, the higher the risks to completion.

The greater the level of risk, the more important it is for the project company and the project sponsors to demonstrate that they have the appropriate level of experience to manage these risks. Lenders will, in particular, scrutinise the track record of the sponsors in developing the type of project under consideration. Higher risk projects also increase the challenges associated with risk transfer to construction and development contractors. Project finance lenders will normally expect completion risks to be substantially mitigated through a single point EPC contract with a highly experienced and credit worthy contractor. For large and complex projects this level of risk transfer to a single contractor is often impossible to achieve. It would, for example be unreasonable to expect a single contractor to be fully exposed to the financial liability of a US$ 15 billion offshore gas field development project. In the oil and gas industry, therefore, lenders are normally confronted with multiple contractors, each employed pursuant to separate EPC contract packages and with limited financial liability.

Project Finance Approach to Completion Risk

Failure to complete a project on time and within budget can have a disastrous impact on the financial and contractual structure of a project finance transaction. The project contracts that underpin the project revenues are likely to be severely impacted by project delays. The project company may have to pay compensation to contract counterparties or, in the worst case, contracts can be terminated. Furthermore, at some point the project company will reach the first debt service date under the loan agreements. It goes without saying that failure to pay interest or principal when due will be catastrophic for the project. As a project approaches completion, the project lenders and their representatives generally become more involved in monitoring and controlling activities, particularly if complications arise. The lenders' technical adviser will usually visit the project more frequently as development progresses and report to lenders on the status of commissioning and completion activities. The project development team are also likely to have to agree detailed testing procedures with the lenders and their technical adviser well in advance of any completion tests. If the project does begin to experience completion challenges then lender engagement will become even more intrusive. Frequent lender meetings will probably be needed and waivers or amendments to the loan documentation may be required. In the worst cases, lenders may become involved in decision-making or even take-over the project.

Given the significance of project completion to the financing structure, it is important to determine when project completion actually occurs. This involves precisely defining and agreeing the parameters that need to be fulfilled for the project to satisfy the conditions to completion. A number of important terms will be defined in the various project contracts and financing agreements and it is essential that the rights and obligations of all the parties involved in the project are fully understood. The EPC contractors and finance parties can be significantly impacted once project completion under a particular contract has been achieved. In particular, an EPC contractor will usually hand-over responsibility for the relevant parts of the project at completion and will be relieved from further liability for delays and additional costs. Completion support arrangements incorporated into the finance documents will also typically fall away once project completion has occurred. Although completion terminology varies considerably according to the particular contractual arrangements, the following are some of the more important completion concepts:

- *Mechanical completion*: This is the point at which the construction activities are completed and the installed plant is ready to be mechanically tested and pre-commissioned.[2]
- *Ready for start-up*: At this point the plant and its components are ready for the introduction of feedstock in order to begin commissioning procedures. Performance tests are carried out on each item of equipment and on the relevant sections of the plant.
- *Provisional acceptance*: Provisional acceptance occurs once the relevant performance tests have been passed and it is at this point that the contractor hands over the works to the project company. The final instalment of the contract price will be paid once provisional acceptance has been achieved and any retention monies released.
- *Final acceptance*: Following provisional acceptance the construction contractor usually remains liable for warranty items during the warranty period. Final acceptance occurs at the end of the warranty period at which point the contractors' liabilities end.

The testing procedures typically carried out pursuant to an EPC contract are not normally designed to test the long-term operational performance of the project. As a result, project finance lenders will usually expect the project to complete a specifically designed testing regime commonly referred as a 'lenders' reliability test'. This test is designed to demonstrate that the project is capable of

2. Mechanical testing and pre-commissioning activities typically involve leak and pressure tests, testing of control systems, the 'cold testing' of installed plant and equipment and so on.

achieving the base case operating assumptions for an extended period of time. Rather than demonstrating the performance of individual items of equipment or the specific work packages, the lenders reliability test is required to demonstrate the operation of the complete project. A fundamental requirement of the test is that, during the test period, operations are carried out according to the project's long-term organisational structure and under the supervision of the proposed long-term management team. Further important elements of a lenders' reliability test usually include:

- *Test criteria*: The test criteria are extensive and tailored to the particular project. During the test period the project will usually have to produce a minimum quantity of on-specification production. The quantity to be produced is based on the long-term technical assumptions that underpin the base case economics (as opposed to, for instance, design capacities guaranteed by contractors). The production will need to be exported and shipped to the customer. Any feedstock requirements should be consistent with the base case assumptions and operating costs during the period should not exceed a certain percentage (typically 20%) of the budgeted costs.
- *Duration of tests*: The duration of the test is often subject of significant debate and negotiation. The lenders will want to ensure that the test period is sufficiently long to ensure that the reliability of the plant is properly demonstrated. Sponsors, on the other hand, will want the shortest possible test duration, especially if the release of guarantees and other forms of support depend on the test result. Test durations have been agreed ranging from 30 days to over 180 days. The longer test periods apply to more complex projects involving novel technology or special conditions (including, for instance, highly variable climatic conditions).
- *Test procedures*: The lenders' tests may require specific procedures (including, for example, sampling methods, measurement procedures and so on), which will need to be accommodated in advance. The lenders' technical consultant will be involved in developing the test procedures and will attend the project site to witness and approve the tests and test results.
- *Pre-conditions*: Prior to performance of the lenders' test, all the relevant EPC contract tests should have been completed and the plant handed-over to the project company by the EPC contractor. In addition, the plant should usually have demonstrated a period (1 month, for instance) of stable operation under normal operating conditions.

The testing procedures will also usually accommodate a certain period of plant shutdown during the tests and re-testing in the event that the project is unable to pass the tests. The negotiations of all of the various provisions of the lenders' reliability test can become protracted, complex and the subject of significant disagreement. Given the unique nature of projects, it is also difficult to standardise reliability tests and most projects will require customised testing regimes tailored to the specific characteristics of the facilities.

The passing of a lenders' reliability test is often an important condition to the release of completion support arrangements. Passing the test is, for instance, usually required to release sponsor completion guarantees. The detailed negotiation of the lenders' reliability test can take a significant amount of time and effort, especially given the unique nature of projects. It is important for the parties involved (including financial advisers, legal and technical consultants and so on) to be experienced in negotiating these tests and to fully understand the needs of the lenders in the completion testing of projects.

12.4 CONTRACTORS AND CONTRACT TERMS

The contractors employed to design, construct and commission a project play a critical role in all phases of development. The contracts that define how these contractors work, will also determine the extent to which development risks are transferred away from the project. Contractors and contract terms thus represent a vitally important element of completion risk mitigation and will, as a result, be the subject of detailed due diligence by project finance lenders. The terms of development contracts are, however, highly complex and reflect the risks and challenges involved in developing major projects in the petroleum industry. The contracting industry also has a reputation for disputing contract terms and the resulting disagreements often lead on to arbitration or litigation proceedings. Analysing the extent and effectiveness of completion risk transfer pursuant to a typical EPC contract is, therefore, no easy task.

Managing contractors is a major undertaking in itself and many companies have limited experience in this area. To add to the difficulties, project contracts are normally awarded following a competitive tendering process. To win contracts, contractors may bid aggressively only to try to recoup earnings during the contract execution phase with claims orders and contract variations. The following sections will examine some of these issues in more detail.

12.4.1 Contractors and Contractor Management

Large projects in the petroleum industry, whether in the upstream, midstream or downstream, are usually undertaken using multiple contracts with contractors specialised in particular areas of trade. A large offshore project, for instance, will usually require specialised contracts with drillers and well-service specialists, sub-sea equipment fabricators and installers, floating vessel hull and topside manufactures, pipe suppliers and so on. As a result, there is often a surprisingly wide range of different contracting entities that may be required to develop a particular project in the petroleum industry. Each element of the project will need to be designed and specified, after which contractors will be approached for quotations. Thereafter, contracts will need to be negotiated and signed and then properly managed. This is an onerous task and given the importance of each element of any particular project, the success or failure of the project could turn on the performance of any one of the many contractors or sub-contractors employed by the project company.

Contractors vary considerably in size, experience and financial acceptability. The largest contractors in the oil and gas industry employ tens of thousands of people and operate globally. These organisations are highly sophisticated and provide a wide range of general contracting services often working in several different industries. In contrast, smaller contractors are focused on providing specific expertise and in many cases are leaders in providing essential technology, albeit often in relatively narrow and specialist areas. In the offshore industry, for instance, there are only a limited number of contractors capable of laying deep-sea pipe. Likewise, there are a limited number of suppliers of cryogenic heat exchangers for LNG plants.

It is often the case that a large contractor will act in an overall coordination role for the whole or a major element of a development contract. This role is usually referred to as 'general contracting'. The general contractor will then enter into a variety of 'sub-contracts' with specialist firms to provide specific equipment, services and so on. The contractor, in this case, is referred to as a 'sub-contractor'. The relationship between the general contractor and the sub-contractor can be complex, especially when the subject of the contract is complex. A drilling contractor, for instance, may enter into a sub-contract for specialist drilling services such as down-hole surveying or directional drilling. The performance of the sub-contractor is often critically important to the overall project and hence difficulties in these contracts will flow through into the contract signed between the project company and the general contractor. A further area of complexity concerns the situation whereby the general contractor is obliged to enter into a specific sub-contract that has been already identified. This is known as 'nominated' contracting. A general contractor will usually not take responsibility for the performance of a nominated sub-contractor.

Joint ventures are a further common feature of the contracting industry. Contractors often form consortia to bid for EPC work. The advantages of doing this include sharing of expertise, better coordination of joint work and the bringing together of specific areas of specialism. Some contractors have taken collaboration a stage further and formed global alliances allowing them to deepen their relationship even further. Contractors will typically form unincorporated joint ventures to execute any particular contract. Dealing with several different contractors or contract consortia can be a complex and challenging task. Coordination of the different contracts and the effective flow of information between the different contractors are essential. Decisions need to be made and instructions given in relation to each contract package.

12.4.2 Construction and Development Contract Terms

Construction law is a specialised and complex area of commercial law involving many areas of general contract law. The terms of construction contracts reflect the specialist nature of this area of law. For many projects, the success of the venture can, to a large extent, depend on the strength of the underlying commercial arrangements during the construction period. Project finance lenders and their lawyers will thus analyse the terms of the construction contracts and the resulting 'bankability' of the overall contractual arrangements between the project company and the various contractors. Although project sponsors and contractors are largely free to agree whatever terms they may want, in practice a variety of standard form contracts are normally used as the starting point for negotiations. Standard form contracts commonly used in project finance, include those produced by the International Federation of Consulting Engineers (FIDIC), the Joint Contract Tribunal (JCT), the Institution of Civil Engineers (ICE), the Institution of Chemical Engineers (IChemE) and others. The unique nature of many projects in the oil and gas industry and the need for specific risk allocation in project finance means, however, that standard form contracts are rarely used without significant amendment. Whichever form of contract is eventually agreed, the following common terms usually need to be addressed:

- *Scope of work*: The scope of the contract defines the responsibilities of the contractor. To ensure acceptable project finance risk transfer the contractor's responsibility should cover the full scope of the project including design, construction, completion and performance of the works. In practice this can be difficult to achieve particularly where technology and design packages are being provided by third-party licensors. Contractors will often be reluctant to accept design risks relating to third-party licensed technology.
- *Contract price and payment*: Project lenders usually expect the contract price to be fixed in the same currency as the loan and with the minimum degree of flexibility for variations. Payment is normally made according to the achievement of specific milestone. A certain proportion of the contract price is typically retained as security for performance and released once final acceptance has been achieved.
- *Project design*: Design risk has been covered earlier. The concept of 'relied upon information' may be incorporated into construction contracts whereby the contractor limits liability relating to technology licence packages. This can create some difficulties for lenders given that the monetary liability of technology licensors is usually very low and insufficient to cover cash shortfalls in the event of completion delays.
- *Schedule and completion*: The contractor will agree to a final completion date and develop a schedule or programme of activities. The contractor may be obliged to submit revised schedules if progress is falling behind. The contractor will, however, usually be allowed to claim for extensions of time in specific circumstances.
- *Performance guarantees and tests*: The contractor should guarantee the performance of the facility and performance levels will be assessed pursuant to a range of tests. The relationship and interconnection between the EPC

contract and any technology licence agreements often presents challenges. Ideally the EPC contractor should take responsibility for any licensed technology. In practice, however, this can be difficult to achieve.

- *Variations and change orders*: The contract will include detailed provisions to accommodate changes to the project and allow the contractor to submit change orders in order to recover any increased costs or changes in schedule.
- *Liquidated damages*: The usual remedy for any breaches of contract terms is for the innocent party to claim damages for the losses suffered. In an attempt to avoid disputes, it is customary to pre-define the level of damages that may be payable in particular circumstances. These contractually agreed damages are known as 'liquidated damages'[3] and are usually included in construction contracts to cover delay and performance defaults.
- *Performance security, bonds and guarantees*: The contractor is usually obliged to issue various forms of security, including performance bonds, advance payment bonds, parent company guarantees and so on. The amounts of the project bonds can be significant and project finance lenders often expect to take a security interest in these bonds.
- *Sub-contractors and nomination*: Most EPC contractors sub-contract a significant proportion of the works to other parties. The use of sub-contractors can create challenges and problems encountered in the construction period often originate in poor performance of sub-contractors. It may be desirable, therefore, for the project company to influence the selection of sub-contractors through approval rights or similar mechanisms. The project company may in some instances nominate particular sub-contractors.
- *Limitations on liability*: The overall liability of the EPC contractor is generally limited to a specified percentage of the total contract value, typically in the range of 15 to 25%. Sub-limits will also be applied to liability for delays and performance, typically in the range of 5 to 15%. These limitations on contractor liability mean that the ability to transfer risk pursuant to an EPC contract is relatively modest.
- *Termination*: Given the critical importance of the EPC contract to the successful development of a project, the ability of the contractor to terminate the EPC contract should be severely curtailed. In addition, the lenders will want to ensure that the contractor enters into direct agreements.

Other terms include governing law, dispute resolution, force majeure, taxes and insurance. For specialist contracts there will typically be additional terms that reflect the particular types of activities being undertaken. The offshore, shipping and drilling industries in particular have specialised contracts, which may vary significantly from the generic contractual forms referred to earlier.

3. The definition and calculation of liquidated damages need to be carefully drafted. If liquidated damages do not reflect the true level of damage suffered by the injured party then they may be classed as penalties and hence unenforceable.

Special care is therefore needed to ensure that the risk allocation pursuant to these contracts is fully understood.

The contractual arrangements for projects involving global procurement and multiple contractors, usually require additional considerations. It is common, for instance, to split EPC contracts into separate onshore and offshore components. The onshore contract usually involves the use of a local subsidiary of the parent contractor and allows the contractor more flexibility in regulatory compliance and tax structuring. Split EPC contracts can, however, add additional complexity and the project company and lenders will want to ensure that the provisions of the separate contracts, together with any parent company guarantees, satisfactorily replicate the terms of a single point contract.

12.5 ECONOMICS OF PROJECT DEVELOPMENT

Cost overruns, schedule delays and production shortfalls will invariably have a negative impact on project economics.

12.5.1 Cost Estimates

Estimating costs is essential for any project investment decision. Without knowing the investment outlay needed to complete a project it is impossible to understand whether the project will be viable. A cost estimate is a forecast of the likely expenditure required to develop a project, and is based on the information available at the time of making the estimate. As projects progress, more information becomes available and, as a result, cost estimates change over time (and should become more accurate).

There are a variety of methods for estimating project costs and the choice of method is largely determined by the information available and hence the phase of development of the project. As a result, there are a variety of different types of estimates and each type often has a different use. It is common to classify cost estimates according to accuracy of the estimate and purpose of use. In general, three levels of cost estimate are commonly used. Firstly, there are preliminary cost estimates, which are based on limited data and used for initial feasibility. These are typically accurate to within ±30% range. Secondly, there are estimates that are used as a basis for the authorisation of funds for proceeding into design and tendering. These are typically based on ±15% accuracy. Thirdly, there are detailed estimates, which are used for project cost control and are normally based on actual quotations and completed designs. A more detailed classification system for cost estimating has been developed by AACE International[4] and is summarised in Table 12.1.

4. AACE International is a non-profit association based in the United States, which aims to provide cost management and project schedule expertise through standard setting and professional certification. See www.aacei.org.

TABLE 12.1 Classification System for Cost Estimating Developed by AACE International

Estimate class	Level of project definition	End usage	Expected accuracy range
Class 5	0–20%	Concept screening	−50%/−20% to 30%/100%
Class 4	1–15%	Study or feasibility	−15%/−30% to 20%/50%
Class 3	10–40%	Budget, authorisation of control	−10%/−20% to 10%/30%
Class 2	30–70%	Control or bid/tender	−5%/−15% to 5%/20%
Class 1	50–100%	Check estimate or bid/tender	−3%/10% to 3%/15%

Source: Adapted from AACE International Classification System

In practice the most significant investment decisions and funding commitments usually have to be made in the early stages of project development with limited information. Despite this, however, early project cost estimates are essential and especially so in project finance transactions. Lenders will usually require Class 3 or Class 2 estimation accuracy for the purpose of the base case financial modelling assumptions and hence the basis of their lending decisions.

12.5.2 Project Schedule

A project schedule provides a detailed analysis of the tasks, activities, events and milestones of a project. The control of the project schedule is usually achieved by illustrating the timing of tasks and events on a chart. These charts, known as ‘Gantt charts’, place the tasks vertically on the left and time running horizontally from left to right. The start point, duration and end point of a task are represented by a horizontal bar. Additional information is usually incorporated into Gantt charts to show activity dependency, resource requirements for individual tasks and major events and milestones. For large and complex projects, Gantt charts are usually developed to show various levels of detail. A summary level, commonly known as Level 0, highlights the major milestones for the project. Levels of detail then move through to the highest level of detail, which is usually generated and agreed contractually with the relevant construction contractors.

An important aspect of project scheduling is the ability to analyse the schedule and examine the most important tasks that could potentially impact the project schedule. The tasks, which together make up the longest period of time for the project, are known collectively as the ‘critical path’. Any delays to tasks on the critical path will result in a delay in the project. The ability to understand which tasks lie on the critical path and which tasks create most sensitivity to the overall project schedule, is important for the lender analysis of completion delay risks. Project finance lenders will want to analyse the project critical path and understand the implications of delays to specific tasks. This analysis will then run through into sensitivity analysis on the project finance model to assess the likelihood of the project overrunning and the implications of overruns on the economics of the project and ability to service debt. The lenders may expect specific structural mitigants to be included in the project financing structure if the results of this analysis show that the lenders are exposed to unacceptable schedule risks.

12.5.3 Economic Consequences of Delays and Overruns

Completion risks impact project economics primarily through the effect of cost overruns on project costs. In competitive and capital-intensive industries project cost increases will usually have a highly detrimental impact on the ability of the project to service capital. In the worst case severe cost overruns can make a project uncompetitive and uneconomic.

Cost overruns and completion delays are mitigated through careful management of budgets and schedules. Most important, however, is the robustness of initial project definition, budgeting and risk analysis. Sufficient contingencies should have been included in cost budgets to ensure that completion risks can be mitigated without destroying project economics.

Project finance lenders are principally concerned with the repayment of the loan with an adequate return. Delays to completion can result in the borrower being unable to service the first repayments and this will then automatically result in default, a situation, which the lenders will want to avoid at all possible cost. A great deal of time and effort is normally spent by borrowers, lenders, consultants and lawyers developing bankable financing structures that satisfactorily mitigate completion risks and, in particular, the risk that the borrower will not be able to honour its first repayments. Given the importance of this aspect of project finance, completion risk mitigation is covered in more detail in Section 17.7.1.

Chapter 13

Political and Environmental Risks, Tax and Insurance

Chapter Outline

13.1 INTRODUCTION

Earlier chapters have examined project specific risks in the various sectors of the oil and gas industry particularly risks relating to project development and operation, feedstock supply and product markets. It is, however, often found that the most difficult challenges faced by projects come from the wider political environment within which the project is being developed and operated. Not only can politics seriously interfere with project performance but political risks are also difficult to predict and to plan for. The environmental and social impact of projects can also be a source of considerable risk and there are numerous examples of project viability being seriously threatened by these risks. Tax is a further potential source of general cashflow risk. The tax treatment applied to particular projects or industries can be politically motivated and tax risks are often difficult to manage and mitigate. In addition to these general project risks, this chapter will also examine the insurance aspects of project finance and the role that insurance can play in mitigating these wider project risks.

Section 13.2 looks at the risks that are associated with the particular location of a project. Political and country risks cover a wide range of issues ranging from expropriation to weak legal and administrative structures. These risks are often difficult to quantify but nevertheless need to be carefully assessed and managed to ensure that project viability is not threatened.

Section 13.3 then examines the environmental and social impacts of projects in the oil and gas sector and how environmental and social issues are managed in the context of project finance. Environmental and social risk analysis and mitigation play an increasingly important role in project finance and, as a result, sponsors of projects need to understand the extent to which environmental considerations can impact the project finance process.

Section 13.4 considers the issue of taxation and the various ways that tax regimes can impact projects in the oil and gas industry. Tax is often one of the most important components of project cashflows and the tax consequences of particular project structures can be difficult to properly evaluate.

Finally, Section 13.5 covers the role of insurance in the petroleum industry and considers how insurance can be used as a form of project risk transfer. For large-scale petroleum industry projects the monetary value of cover under various insurance programmes can be very large. Project finance lenders therefore view insurance as a valuable source of potential debt repayment if an insurance event occurs.

13.2 POLITICAL AND COUNTRY RISKS

It is generally more challenging to raise capital in difficult jurisdictions. It goes without saying that raising funds for investment in a country such as Uzbekistan is going to be more difficult compared to the same exercise in the United States. Sources of funding are more constrained and this means that the costs of finance can become excessive and even prohibitive. Difficult jurisdictions will also raise additional challenges for project finance. The risks to project cashflows are often greatly increased when a project is located in a politically unstable jurisdiction. Government policies can dramatically change the economic, regulatory and fiscal environment within which a project is being developed and operated. Furthermore, it is often hard to quantify the risks associated with a project's location. The sensitivity of project cashflows to movements in product prices is relatively easy to assess. In contrast, quantifying the cashflow impact of a change in government or the outbreak of political unrest is a very different proposition. Political and country risks are also difficult to define. Governments have a strong influence on almost all aspects of a project's development and operation and it is often not clear whether a particular event is politically motivated or not. Political and country risks can manifest themselves in different forms and through a variety of mechanisms, many of which impact other project-specific risks.

Although political risks impact all projects to some extent, the oil and gas industry is particularly exposed to political risks. Governments typically view the oil and gas industry as nationally important and are involved in the industry in many different ways. We have already seen, for instance, that in the oil and gas industry governments can influence projects through the tax system, through regulation, state participation and government controls on the structure of industry. The following sections will consider these issues in more detail.

13.2.1 Political Risks

Political risks are those risks arising out of the direct influence of governments through their monopoly control over national power. These risks include expropriation, restrictions on access to foreign currency, changes in law, political violence and so on. Because projects in the petroleum industry are often nationally important, governments frequently play a central role in the success of projects in this sector. The stance governments take towards projects can, however, change dramatically over a project's life. To mobilise investment, political support for oil and gas projects is often needed in the early stages of project development. Once a project has been completed and funded, the host government may take a firmer stance towards contentious issues safe in the knowledge that investments have already been made.

Expropriation Risk

Expropriation is the risk that a government forcibly takes over the ownership of privately owned property without proper compensation.[1] This is clearly a significant risk given the reliance of project finance lenders on the cashflows generated by a particular project. Without access to other funds it will be impossible for the borrower to repay project loans. There are a variety of ways in which expropriation can impact a project. The most obvious mechanism for expropriating projects is for the government to directly take over ownership of property. An example of this is the expropriation by the Venezuelan government of four heavy oil upgrading projects in 2007.[2] Alternatively governments may expropriate property indirectly by depriving private sector property owners of the value of their interests. In practice indirect expropriation is difficult to identify. Does the tightening of environmental regulations on the refining industry deprive refinery owners of material value? It can thus be difficult to distinguish between a state's ongoing legitimate regulatory actions and behaviour that crosses over into illegal expropriation.

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1. In general, it is recognised that governments have the right to expropriate private property provided sufficient compensation is paid to the asset owner.
2. In 2007, Venezuelan President Hugo Chávez ordered the takeover of oil projects run by foreign oil companies in the Orinoco River region. The four heavy oil upgrading projects were sponsored by a number of companies including: British Petroleum, Exxon Mobil, ChevronTexaco, ConocoPhillips and Total and Statoil. Venezuela did finally pay some compensation to the investors but only after lengthy international tribunal hearings.

Currency Transferability Risk

Currency transferability risk is the risk that a government imposes restrictions on the movement of currency out of the country. Although governments may impose currency control for a variety of reasons in general currency transferability risk occurs when governments are faced with depleting hard currency reserves.[3] Transfer restrictions are enacted through controls over the transfer and conversion of funds out of local bank accounts. If a country has imposed exchange controls on foreign currency it will usually become impossible for a borrower to service foreign debt obligations. This can seriously comprise the ability of a borrower to service its project finance debt obligations and hence the ongoing viability of a project.

War and Civil Disturbance Risks

War and civil disturbance expose projects to risks that can severely impact the ability of the project cashflows to service debt. There are many examples of projects that have been negatively affected by these types of risk. Feedstock supplies to projects have been interrupted by terrorist attacks on pipelines. Oil and gas infrastructure has been damaged during civil wars. Staff have had to be evacuated from facilities during revolutions. Given that many project finance transactions involve lenders taking project risks over many years, it is very difficult to forecast the likelihood of these events causing disruption to a project financing throughout the life of the loan. It is important to note, however, that despite the serious consequences of these types of risk event, there have, in fact, been relatively few major losses resulting from war and civil commotion.

Change of Law and Other Forms of Government Interference

Governments can influence projects in many different ways and it is thus not easy to determine whether a particular event is caused by government actions or some other reason. Furthermore, governments often enter into commercial agreements with project companies. A state-owned entity may, for example act as a project sponsor, supplier of feedstock or offtaker of the product. In such circumstances, determining whether a government is acting politically or commercially in its dealings with a project can be virtually impossible. One of the most obvious ways that a government can interfere with a project is to alter the legal framework governing the project. The introduction of new environmental regulations can be particularly detrimental to projects in the oil and gas industry. Changes in law often result in increased project costs. Compliance with new environmental laws will usually entail additional capital expenditure relating to the installation of new equipment to reduce or eliminate particular emissions.

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3. There are many examples of governments having imposed exchange controls, one of the most serious of which was the Russian exchange control and debt moratorium in 1998.

Governments may incrementally interfere with projects through progressive changes in laws, administration requirements and industry regulation. Over an extended period of time, relatively small changes, which do not appear unreasonable, can collectively result in significant degradation. This form of government interference is called ‘creeping expropriation’ and can often result in the government effectively taking over ownership of the whole project.

Political risks are normally difficult to identify and challenging to manage. Given the dependency of projects on stable political environments, and the length of time over which project finance lenders are exposed to political risks, it is only natural for lenders to want to reduce these risks far as possible. A variety of structural-technique methods are used to mitigate political risks and these will be explained further in Section 13.2.3.

13.2.2 Country Risks

The political risks, which have been described in the previous section, typically result from the direct impact of government actions on projects. Country risks cover a wider spectrum of risks that are associated more broadly with the structure of institutions within a particular country, its macroeconomic performance and so on.

Macroeconomic Risks

Macroeconomic risks are those risks which impact a project as a result of the wider performance of the domestic economy. These risks include general fluctuations in a country’s economic activity, foreign exchange rates, inflation and interest rates.

- *Economic activity*: Oil and gas export projects tend to be less influenced by the domestic economy compared to projects in other sectors. Projects that sell product into domestic markets, will, however, be much more exposed to the general level of domestic economic activity. A refinery or natural gas project selling to local consumers, for example will be dependent on the performance of the local economy.
- *Foreign exchange*: The oil and gas industry is highly ‘dollarised’ and hence currency risks are often assumed to be of less relevance to projects in this sector. We have already seen, however, that currency risks can be extremely important in the refining industry given that crude oil is usually purchased in dollars whereas refined products sold in domestic markets are ultimately denominated in local currency.
- *Interest rates*: Interest rate risk mitigation is examined further in detail in Chapter 18.
- *Inflation*: General cost inflation can significantly increase project budgets and negatively impact project economics both during the development phase of a project and its operational phase.

In general the impact of changes in macroeconomic variables on project viability will need to be assessed through sensitivity analysis of the project cashflows. If the level of risk is determined to be unacceptable then specific risk mitigation measures may have to be considered, including hedging, reduced debt levels or support from government, multilateral agencies, ECAs and so on.

Legal and Institutional Framework

The legal and institutional frameworks that exist in a particular country typically represent the most obvious and direct contact points between a project and the host government. The characteristics of the local legal system and the structure of the local institutions are thus important in many respects for the viability of projects.

- *Local legal system*: The structure and nature of the local legal system in a host country will impact project finance transactions in many different ways, including property rights, corporate and commercial laws, foreign investment laws, industry specific laws and so on. The ability to take and enforce effective security interests is also usually largely determined by the local legal system. In addition, the predictability and reliability of the local methods of dispute resolution, including the structure of local courts, may play a significant role if parties need to resort to local legal processes.
- *Institutional framework*: A country's institutional framework will normally determine various important processes that need to be followed for obtaining relevant decisions, authorisations and approvals from relevant local authorities. The efficiency and reliability of local institutions varies considerably and depends on a variety of factors, including the maturity of the jurisdiction, the quality and resourcing of relevant departments and so on. Poorly functioning, under-resourced or politically driven institutional structures have been known to create significant problems for projects. Furthermore, there may be a lack of clarity in terms of responsibility between different government departments and coordination may be seriously lacking. It is often found, for instance, that countries with limited experience in the petroleum sector often lack suitable institutional structures to manage the local development of the industry.

Project lenders and investors will need to carry out a detailed investigation into the local legal and institutional structures. Structuring project finance in countries where there are limited precedents can be a significant challenge and, in some cases, new local laws, systems or structures may be required to ensure that the project can be properly implemented.

13.2.3 Management of Country and Political Risks

Although country and political risks are difficult to analyse and assess, it is vitally important for lenders and investors that these risks are properly understood and managed. Lenders in particular are often constrained in their ability to take exposure to borrowers and projects located in particular countries. Some countries are subject to sanctions or controls that can prevent institutions extending loans to borrowers in those countries. In addition, commercial banks are often subject to organisational and regulatory constraints on their ability to increase exposure to particular jurisdictions. As a result, banks have onerous internal and external obligations to report country exposures and must therefore ensure that effective management systems are in place to control and monitor exposure to country.

Country Ranking

The most common system of measuring, comparing and assessing country risk is to establish a method of risk scoring. Independent external country risk scoring systems and methodologies are available, many of which are used by lenders and investors to rank countries according to the risk score. Large institutions also invariably develop their own methods of country scoring and ranking. Commercial banks, in particular, commonly monitor and assess country risk through their own methodologies using specialist country risk departments. Whatever method of risk assessment is used, however, it is usually essential to have access to in-country information sources. Large international corporations with extensive global branch networks are clearly well placed to gather country risk information at source.

Country Limits

An important method that lending institutions often use to manage country risk is based on the establishment of lending limits for individual countries. These limits set the maximum financial exposure that an institution is prepared to take to borrowers in a particular jurisdiction. Although the methods for determining limits differ amongst institutions there are a number of common practices, particularly amongst the international commercial banks. Country limits are generally determined on a periodic basis, typically annually or semi-annually. The limit setting process is typically managed centrally by a dedicated head-office department or committee. Although various factors are normally used to determine limits, country rankings will usually have the more significant bearing on the absolute limit for a particular country. High-ranking countries in developed markets may, for instance, have no exposure limits, whilst zero country limit availability is often applied to the lowest ranked countries. Even if limits are available for the lowest ranked countries, mandatory provisioning or collateralisation may be required for any exposure. This will result in increased lending costs to borrowers in these jurisdictions.

Country limits may be divided into a number of sub-limits depending on the type of exposure and structure of any particular transaction. Separate sub-limits are usually determined, for instance, for long-term and short-term exposures. Guarantees, insurance and other structural enhancements or security will also usually determine the exact country limit treatment of a particular transaction. Comprehensive ECA cover will, for example, normally transfer the exposure from the country of the borrower to the country of the relevant ECA. A US$ 100 million loan to a Nigerian borrower, which is supported by 90% comprehensive cover from the UK's UKEF, will be typically booked for as a US$ 90 million UK exposure and US$ 10 million Nigerian exposure.

Establishing or increasing limits for countries in difficult jurisdictions is often challenging. It will normally take an institution several months to work through the necessary internal processes. If country limits are being established for the first time then due diligence trips may be required and meetings arranged with relevant government organisations, potential clients and so on. Sponsors considering project finance for projects in difficult country should therefore understand any lender constraints and prepare potential lending institutions well in advance if country limit availability is likely to be a constraining factor.

Structural Risk Mitigation

As we have seen, project finance structures are based on the concepts of risk analysis and risk mitigation. The same principles that are used to allocate and transfer commercial risks, can in principal be used to allocate and mitigate political and country risks. There are a variety of structural enhancements that are commonly encountered in project finance transactions. Political and country risks can, for instance, be transferred to third parties through financial guarantees and insurance. We have already seen that to support national exports, ECAs provide a variety of financial risk mitigation schemes to project finance lenders. Project sponsors also often provide financial support to lenders through support mechanisms, including comprehensive completion guarantees and so on.

13.3 ENVIRONMENTAL RISKS

The development and operation of large projects can have a highly detrimental impact on the wider physical environment within which the project exists. This is especially true for oil and gas projects, the industry having been responsible for many well-known environmental accidents in the past. Furthermore, oil and gas development projects often impact the social environment in local areas, including disruption due to resettlement, impact on indigenous populations and so on. Social and environmental risks can thus have serious consequences for project sponsors and lenders both in terms of cashflow risks[4] and reputational risks.

4. The concept of 'negative externality' is commonly used when considering the economic consequences of environmental impacts. A negative externality is based on the notion that cashflows from projects exclude significant costs to society at large. These costs, such as pollution, are external to the project but must still be paid for. To 'internalise' these externalities, governments often intervene by imposing regulation and costs on producers, including elimination at source, fines, taxes and so on.

13.3.1 Environmental and Social Impacts

We have already seen that projects in the oil and gas industry present potentially significant risks to the environment and, as a result, sponsors, developers and financiers must understand the potential impacts that particular projects can have on the wider physical and social environment.

Environmental Emissions

Most industrial activities result in a certain level of emissions to the environment. These emissions generally fall into three broad categories: atmospheric emissions, aqueous emissions and ground emissions.

- *Atmospheric emissions*: Almost all activities in the oil and gas industry produce emissions that disperse into the atmosphere, especially exhaust emissions from furnaces and turbines, leaks, accidents and fugitive emissions. Many of these emissions are hazardous and potentially harmful to humans. Not only does the extraction, transportation and processing of hydrocarbons contribute to harmful emissions but the combustion and usage of petroleum fuels also is one of the greatest, if not the greatest, sources of atmospheric pollution.
- *Aqueous emissions*: Petroleum industry activities are a major source of water pollution. Drilling operations, materials storage and transportation can all release harmful substances into aqueous environments. In addition, we have already seen that the offshore oil and gas industry represents a major threat to the world's oceans and hence pollution from offshore activities is a particularly high risk.
- *Ground pollution*: Leakages and spills of material from storage tanks and pipelines often occur in the industry. These releases often permeate into the ground resulting in potentially serious environmental damage. Ground pollution can accumulate over many years and can disperse into groundwater impacting drinking water often far from the original source of pollution. The costs of rectification can be substantial.

Lenders and investors will need to understand the full impacts of project activities on the physical environment throughout the life of the project.

Social Impacts

Projects also have a significant impact on the social characteristics in the locality of the project. There has been a growing awareness of the impacts projects have on affected societies and, as a result, the assessment and management of social impacts has taken on greater significance. Sponsors and lenders to projects therefore need to pay much closer attention to the social risks involved in project development and operation. Examples of some of the common issues that need to be considered, include impacts on employment patterns, culture and heritage, health impacts and community cohesion. Oil and gas projects can in particular have a potentially very significant impact on local societies. In remote locations the way of life of indigenous populations can be completely transformed by petroleum activities. Project sponsors, investors and lenders should not underestimate the extent of work, which needs to be undertaken in this area, and the potential risks associated with mismanagement of social impacts.

Environmental and Social Impact Assessment

To understand and assess the acceptability of environmental and social risks, project sponsors and lenders undertake detailed due diligence on environmental impact. The most important element of this due diligence exercise is typically an environmental and social impact assessment, or 'ESIA', normally carried out by third party specialist experts. An ESIA will usually cover the following areas:

- Project description and technical overview.
- Baseline survey of the existing environmental and social conditions.
- Assessment of impacts on the existing baseline.
- Review of alternative solutions.
- Risk mitigation measures.
- Risk management and monitoring.
- Stakeholder consultation and disclosures.

It is normal practice for the sponsors to prepare an ESIA for the project and this is typically a requirement under local laws and in-house company policies. Lenders to a project will use the project level ESIA to perform their own due diligence work and they will make use of their own third-party consultants to undertake a full review of the ESIA and related work of relevance to the project.

Environmental Laws, Regulations and Guidelines

Whether project finance is used or not, a project must comply with all the relevant environmental and social laws, regulations and guidelines that apply to each stage of project development and operation. The necessary approval and permitting of project development and operation will be the responsibility of the relevant local authorities. The permitting and approval process may involve several different authorities with potentially overlapping responsibilities. Furthermore, it may be found that these authorities have extremely limited capabilities in certain areas. The first-time development of an LNG facility in a country may, for example, require the adoption of completely new in-country guidelines and standards. The permitting and approval process can therefore be arduous and time-consuming.

Project sponsors will also be keenly aware of the requirements to adopt industry best practices for project under their control. Many organisations have their own internal standards, which should ideally be applied consistently to all of their investments no matter where located. Although these internal company standards are often more rigorous than local requirements, conflicts can also arise which, unless identified early, can create significant challenges.

13.3.2 Managing Environmental Risks

The scale of risk that a particular project poses to the environment, is a function of both the characteristics of the project and the sensitivity of the surrounding environment. Projects in the petroleum industry involve the handling of large volumes of potentially damaging materials in complex, large-scale industrial processes. In addition, many projects are developed in highly sensitive environments including, for example, the Arctic, deep sea, sensitive habitats and so on. Managing the environmental risks in the petroleum industry is highly challenging and environmental issues will thus represent a significant element of any project finance transaction in this industry. Environmental and social risk management in the context of project finance is covered in further detail in Section 15.4.5.

13.4 TAXATION AND THE PETROLEUM INDUSTRY

Tax is the principal means by which governments collect money to fund public sector activities. The approach that governments adopt towards taxation and spending is known as fiscal policy. In addition to direct impacts on project cashflows through tax payments, fiscal decisions made by governments also influence the wider economy. Government tax and spending policies can thus have a wider impact on project economics and need to be understood as part of the appraisal of project viability.

Tax systems and policies vary significantly between jurisdictions and no two national tax systems are the same. Tax and fiscal policy also vary over time. It is therefore challenging to understand the full impact of tax on project viability and cashflows. Tax liabilities are, however, paid in priority to most other project costs, including debt service and dividend payments. Any changes in the level of tax payable throughout the life of a project can have a potentially material impact on the ability of a project to fully service its debt. There are in fact many examples of projects that, due to government tax policy, have either failed to proceed or experienced significant financial problems during operation.

Tax is a particularly important consideration in the oil and gas industry. The industry operates across national borders and hence the impact of the tax burden on projects from multiple jurisdictions frequently needs to be considered. As a further complication, tax regimes often overlap and the same project cashflows can often generate tax liabilities in more than one country. Optimising tax affairs in the petroleum industry is thus challenging and will often influence wider project finance structuring decisions including corporate structures (which tax jurisdictions apply), capital structures (debt vs. equity), dividend policies and so on.

13.4.1 Types of Tax and Determination of Tax Payable

Governments have shown great ingenuity in devising tax regimes to maximise their economic stake in oil and gas projects.[5] Tax can impact project finance cashflows in a variety of ways some of which only become apparent once a project begins to operate and pay tax. The way a project is taxed depends on several factors, the most important of which is the tax jurisdiction of the project company. Although no two jurisdictions are the same, the more common forms of tax for oil and gas projects include:

- *Profit taxes*: These are taxes charged on the profits that companies earn. In most cases taxable profits are not the same as accounting profits and special rules apply for determining the profits chargeable to corporation taxes. These rules typically cover allowances for capital depreciation, allowable and disallowable expenses and the treatment of profits and losses within a group of companies. Joint venture arrangements can create challenges. The various members of a joint venture may be subject to different tax treatment. Domestic joint venture partners may, for instance, be treated to a different set of rules compared to international partners.
- *Revenue or income taxes*: These are taxes charged on gross income. The Russian minerals extraction tax is an example of such a tax and is calculated on revenues as opposed to profits. These taxes are incurred whether a company is profitable or not, which clearly presents challenges in the context of project finance given that the project borrower may be liable for tax even when free cashflow is negative. The rationale for imposing revenue taxes rather than profit taxes is that, in general, revenues are less easily manipulated compared to profits and hence, for governments, revenue taxes are considered a more reliable form of taxation.
- *Royalties*: Royalties are a common form of taxation imposed by governments on mineral extraction activities. The calculation of royalties is typically based on a percentage rate applied to the value of production. For petroleum extraction the value is usually calculated assuming values at the wellhead. The calculations can, however, become complex especially

5. It is often argued that an ideal tax system should aim to ensure that the state retains the excess profits (or 'economic rent'), which arise from the exploitation of a nation's natural resources. In practice ensuring that a tax system both stimulates investment while at the same time maximises the proportion of excess profits taken by the state is highly challenging. The result in the oil and gas sector is that most petroleum fiscal systems include a variety of unique and complex tax arrangements, the impact of which on project economics is often difficult to fully assess.

if certain types of deductions are allowed (for instance deductions for the transportation of produced fluids to shore from offshore projects).

- *Witholding taxes*: A withholding tax is a tax that governments require to be deducted at the source of a payment. Withholding taxes impact many commercial transactions. In the context of project finance, withholding taxes are most commonly encountered when interest and dividend payments are made by the project company. When paying interest to foreign lenders, for instance, a borrower must often 'withhold' a specified percentage of the interest payment and pay this amount over to the local government as a tax.
- *VAT*: VAT is charged on the sales of goods and services and can involve significant sums if charged on the construction costs of a new project. In such cases a special VAT loan facility may be put in place to fund the VAT obligations of the project company. The VAT loan facility will typically be repaid out of the VAT charged by the project company on its future sales.

Upstream projects can be subject to specific and unique tax regimes. In the United Kingdom, for instance, there have been a variety of special petroleum taxes, which supplement general corporate tax rates and increase the overall tax take on upstream oil and gas activities. Other concepts, such as ring-fencing and field taxation, are especially common in the upstream sector. The aim of these features of upstream taxation systems is to isolate the income of a particular field and prevent the cross-subsidisation of upstream profits by losses in other parts of the business. Governments also often seek to incentivise the development of certain types of field through the tax system. Reliefs and capital uplifts[6] are common. Special depreciation allowances may also be possible for particular types of field or expenditure. All of this makes the assessment of the impact of tax on upstream projects particularly challenging but at the same time, critically important.

It should also be noted that tax can be a potential source of foreign exchange risk given that the tax is payable in local currency whereas many projects have a strong element of US dollar foreign currency exposure. The only effective way to deal with this risk is to model the project cashflows in the local currency so that the tax calculations are based on the correct currency. All foreign currency cashflows in the financial model will then need to be converted into local currency at assumed exchange rates throughout the forecast period. Sensitivity analysis can then be performed on the forecast cashflows to establish the sensitivity of coverage ratios to changes in the underlying exchange rates.

6. Capital uplift refers to additional capital deductions against taxable revenues, which are often allowed on certain specified upstream petroleum assets. This additional allowance is usually calculated by applying a percentage increase to eligible capital expenditure. Governments often use capital uplift to incentivise investment in the upstream industry through the tax system.

13.4.2 Managing Tax Risks in Project Finance

It is normally possible to accurately calculate and assess the impact of tax on project economics based on the tax rules and legislation that exist at the time of forecasting. It is also generally possible to develop acceptable project structures which optimise the tax payable by the project sponsors, again based on the current tax laws. The major risk associated with tax, however, is that the tax laws change resulting in higher tax payable and hence less free cash available to service debt and pay dividends. This is a real risk as evidenced by increasing and discriminatory tax changes that have been introduced in many jurisdictions over the years. Unlike many other project risks, however, it is not normally feasible to transfer tax risks to third parties. In certain circumstances it may be possible to transfer some tax risk to the project sponsors by, for instance, the sponsors agreeing to take the liability for tax on behalf of the project company. Governments may, in addition, provide tax mitigation through the inclusion of clauses in concession agreements, host government agreements and so on. A stabilisation clause in a PSA is an example of this form of tax risk mitigation. Enforcement of this type of government agreement may, however, be difficult to achieve in practice and open to legal, constitutional or other challenges.

For most project finance transactions the only effective way of dealing with tax risks is to ensure that the project economics reflect the most likely tax treatment of the project over the period during which debt is outstanding. Project finance lenders will hence want to ensure that the tax assumptions in the base case cashflows projections are reasonable and consistent with the tax system. In particular lenders will want confirmation that all relevant taxes have been included and that the tax treatment and tax calculations have been correctly modelled in the project forecasts. Lenders will normally expect to have an independent opinion from a tax expert on the base case tax assumptions.

13.5 INSURANCE

Insurance is based on the transfer of risk to third-party insurers pursuant to a particular type of contract known as a ‘policy’. Insurance is an important technique for managing and mitigating risk and, as such, plays a prominent role in project finance structures. Insurance forms a valuable element of project lenders’ security packages and much time is normally spent developing bankable insurance programmes for project finance transactions.

13.5.1 Concept of Insurance

Insurance involves one party, the ‘insured’, paying a premium to another party, the ‘insurer’, in return for which the insurer indemnifies the insured if certain specified events occur resulting in financial loss to the insured. The relationship between the insured and insurer is documented in a policy that details the risks covered by the insurer and the mechanisms for payment of premiums and making claims.

The underlying concept of insurance is the pooling of risks.[7] When faced with similar but infrequent risks, those exposed to the risk can collectively contribute financial resources to create a wealth pool. In the event of a loss, a member of the pool can make a claim against the pool to rectify the loss. In theory risk pooling can be applied to any form of common risk between any grouping of people or entities. The modern insurance industry, however, is primarily based on private insurance companies administering risk pools and writing insurance policies on behalf of the various policyholders. Although an apparently simple concept, in practice an insurance contract creates a complex set of relationships between the insured and insurer. Furthermore, the insurance industry has developed various practices and terminology that are unique to the industry and can create confusion or misinterpretation.

Insurance Contracts

Insurance contracts are a vital element of risk pooling and determine the risks covered, the premiums charged and the value of the insurance cover. Although insurance contracts are governed by the usual laws of contract, in practice there are important features of an insurance contract that fundamentally impact the relationship between the insured and the insurer. Insurance contracts are governed by the principle of 'utmost good faith'. This requires the insured to disclose all material facts which may impact the risks underwritten by the insurance company. This is an important concept in project finance because of the complex nature of the project risks and the fact that many of these risks change over time. Most insurance contracts are negotiated through a broker and brokers will thus typically play a central role in disclosing project information to the insurers. As a result, lenders will want to ensure that the project company engages with an experienced broker and that this broker communicates directly with the lenders on relevant aspects of the insurance programme.

Insurance in Petroleum Industry

Insurance as a mechanism of risk management is essential for companies operating in the oil and gas industry. We have seen already that the industry is exposed to significant risk throughout its value chain and many of these risks have been pooled by the insurance industry resulting in significant insurance

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7. The modern insurance industry owes much to the merchants based in the City of London, who increasingly used the concept of risk pooling as a form of risk mitigation in the maritime industry. In particular a small number of coffee houses became important centres for the exchange of information on the shipping industry and subsequently places where shipping and cargo risks could be 'underwritten' and insured.

capacity. There are, however, a number of notable characteristics of insurance for oil and gas projects. Potential losses in the industry can be extraordinarily high and the value of cover required tends to be extremely large. Certain risks reach the limit of available capacity in the insurance market or are uninsurable. The marine and offshore sectors of the industry present particular challenges given the difficult physical environment and the high potential financial consequences of losses and damage. The total loss of a floating structure could, for example, result in rectification costs amounting to several billions of dollars. In addition, environmental losses can often significantly exceed the insurance market capacity. There is, therefore, a significant element of self-insurance in the industry and many of the largest companies in the industry have their own captive insurance companies.

The insurance industry has also developed a number of special policies to cover specific industry risks. In the upstream sector, for instance, control of well insurance is an important element of cover. Most large insurers have specialist departments covering oil and gas and they have developed experience and capabilities specifically for the oil and gas industry in policy wording, claims handling and so on.

13.5.2 Insurable Risks, Cover and Terms

The complexity of insurance programmes for projects in the oil and gas industry is a reflection of the wide range of risks to which these projects are exposed. Balancing the cost of insurance against the cover available is a difficult task. For project finance it is essential that the extent of cover is fully understood so that the effectiveness of the insurance programme in terms of risk mitigation can be properly determined. It is not possible to isolate the bankability of the contractual and financial structure from the bankability of the insurance programme and hence the negotiation between all parties can become very complicated.

Insurance for projects is normally divided into construction period insurance and operating period insurance. There are usually significant differences in the risks to a project during the construction and operating phases. Operating phase insurance is normally taken out annually whereas construction period insurance is typically taken out for the complete duration of the construction phase. Construction period losses are usually quite different given that for much of the time during the construction period the project is only partially complete and the value of work done is varying on a constant basis. As a result, the insurance programme for construction phase and operating phase insurances are normally placed with different insurers and under different cover. A significant issue for project finance is, however, the interface between the two phases of insurance. Defining when the construction insurance ends and the operational insurance begins is difficult but important given that any gaps will result in the facility being off cover and any overlap could be expensive in terms of duplicated premiums.

Construction Period Cover

Insurance is usually taken out during the construction period of a project to cover a variety of risks, the most important of which include damage to the plant and equipment on the site, loss of materials and equipment whilst in transit to the site and liabilities to third parties during the construction period. In addition, lenders to a project financing usually also expect insurance cover to mitigate the risks of delay in start-up of the project. These risks are typically covered under a variety of relatively standard types of policy, namely construction all risks, marine cargo, third-party liability and delay in start-up. Construction all risks policies are typically taken out to cover physical losses and damage. The amount of cover required is normally either based on the estimated value of the works or an estimated maximum loss. The cover remains in place typically until completion of the last commissioning or performance tests although the exact mechanism for transition between construction and operational insurances is often developed on a case-by-case basis. The scope of the risks to be covered depends on the nature of the project. In particular, specific cover may be needed for offshore projects and for projects where much of the construction activity takes place away from the site. Whilst construction all risks insurance covers risks on site, equally important is the risk of loss or damage to equipment and materials whilst in transit from the manufacturing location to the construction site. A compressor turbine manufactured in Italy for an LNG project in West Africa, for instance, will involve marine transit and the potential for total loss. This type of risk is usually covered under a marine transit or goods in transit policy.

Construction all risk policies will also include third-party liability and delay in start-up cover. Delay in start-up can be expensive and project sponsors are often unwilling to take out this cover, especially given the potentially long period of initial deductible. In project finance, however, delay in start-up is often an essential element of the lenders security package. Lenders will, however, take a more relaxed view on this if the sponsors are providing completion support during the construction period of the project.

Operating Period Cover

Unlike construction period insurance, operating period insurance cover is usually taken out annually. The main policy during the operating period will be an ‘all-risks’ policy for damage to project property and the cover will be based on an estimated maximum loss (EML) calculation. In project finance transactions, the EML will be investigated and verified by the lenders in conjunction with their advisors. Operational period cover will also include cover for third-party liability and potentially also business interruption insurance.

Although there are standard risks normally covered by operational phase ‘all-risk’ policies, there are often exclusions depending on the specific characteristics of the project. An example of a typical exclusion or a low loss limit would be damage related to earthquakes. This is a common issue for pipeline projects located in seismically active zones, and can be especially problematic for structuring project finance transactions given that exclusions from insurance policies may mean that lenders are exposed to the risk of earthquake damage. In this situation, lenders will normally expect the consequences of earthquake damage to be minimised as far as possible (and potentially at considerably increased cost).

Offshore and Marine Insurance

Offshore and marine insurance is in many ways a distinct sector in the insurance industry. We have already seen in Chapter 9 that offshore and marine projects are exposed to a different range of risks and that the financial consequences of these risks are generally much higher. There is, for instance, a greater likelihood of 'total loss' (i.e. sinking) and the costs of dealing with losses can be an order of magnitude higher. Loss of life, pollution and salvage costs can in some cases be many times higher than the replacement cost of the assets lost. The offshore and marine insurance industry has therefore become a more specialised sector with generally more restricted and volatile capacity and tighter policy wording, including higher deductibles and greater levels of exclusion. In general, three types of policy are encountered in the offshore sector, namely Hull and Machinery, Liability and War. Hull and Machinery policies cover physical losses and are usually placed in the commercial insurance markets. These policies generally exclude war damage and hence separate policies are required to cover war risks. In addition, liability cover is required for third-party losses, including liability for pollution. War and liabilities policies are generally not placed with commercial insurers but rather through mutual insurers, commonly known as War Clubs and Protection and Indemnity (or P&I) Clubs. The nature of these insurers will be dealt with later.

13.5.3 The Insurance Market, Risk Capacity and Reinsurance

The structure of the insurance markets, the market capacity for particular industries and risks, loss records and premium levels can all impact the ability of the sponsors of a project to develop a bankable insurance programme acceptable to project lenders.

Commercial Insurers and Lloyd's of London

The vast majority of insurance business is handled by the many different types of privately owned insurance companies. The largest insurers write a full range of insurance policies whilst smaller companies specialise in underwriting particular types of risk. Commercial insurance companies earn income from policy premiums and invest this income to earn investment returns. The risks that are underwritten pursuant to the various polices will result in payments to claimants as and when any covered risk events occur. The financial solvency of an insurer is therefore dependent on the magnitude and frequency of claims versus the premiums written and the resulting size of the investment pool. It is thus clear that insurance companies are exposed to considerable insolvency risk if investment income is poorly managed and/or the levels of claims becomes unsustainable (due, for instance, to a large risk event). An important consideration for project finance is therefore the credit quality of the specific insurance companies with which the insurance programme has been placed. This will be considered in more detail later.

Unlike commercial insurance companies, Lloyd's of London is a market place rather than a risk underwriter. Lloyd's operates on the basis of bringing together underwriters and those wanting to take out insurance. Lloyd's has a long history in the insurance business and remains an important source of insurance business, especially for more difficult insurance placements. Lloyd's also retains an important position in the shipping and offshore insurance markets.

Mutuals, Self-Insurance and Captives

A mutual insurer is an insurer that is owned by its policyholders. The main advantage of mutual insurance is that the policy holders have full information on the levels of premium charged for the cover and the extent of cover provided under the policies. The use of mutual insurance for project financing creates some additional complexity. The creditworthiness of mutual insurers can be problematic and lenders may not accept the financial risk associated with particular mutual policies. In addition, mutual insurers are often much less flexible in agreeing to the additional lender requirements, which are often needed to ensure that an insurance programme is bankable.

Self-insurance is a method of insuring whereby businesses insure themselves by retaining contingency funds that can then be used when a particular risk event occurs. Self-insurance is often effected through the use of a company owned by the business and established to manage the funds set aside. Special insurance subsidiaries like this are known as captive insurance companies and many large companies have established captive companies to manage their self-insurance activities. It is common for a company to only partially insure risks through a captive and take out an insurance policy to the full value in the commercial market.

Like mutual insurance, self-insurance and captive insurance can raise additional challenges in the structuring of insurance programmes for project finance. Although project finance insurance programmes have included non-commercial insurers the negotiations can become protracted and challenging if the relevant insurer is not experienced in dealing with project finance lender requirements.

Reinsurance and Government Backed Schemes

Reinsurance is a method whereby insurance companies purchase insurance themselves in order to transfer risk onto other insuraners.[8] Reinsurance is normally used by insurance companies to manage their risk levels either due to the size of exposure to specific risks or the type of risk they are covering. In certain circumstances insufficient cover may be available in the private insurance markets and governments may need to provide insurance 'as a last resort'. An example of this is the provision of cover by governments for sabotage and terrorism risk when the risk of such events occurring is significantly increased.

In many jurisdictions it is often mandatory to place insurance with local insurers for cover. This can create significant issues when placing insurance for large projects given that local insurance companies often have insufficient capacity to handle the size of the placement. In addition, the credit profile of local insurers is not normally acceptable to project finance lenders. Project finance insurance programmes typically include an insurance placement with local insurers together with a very high level of reinsurance. This arrangement creates some issues as the project company does not have a direct contractual relationship with the reinsurers and hence lenders have less access to insurance for their security. This is dealt with further in later sections.

Approaching the Market

Insurance programmes for large projects are large, complex and expensive. As a result sponsors need to carefully plan the approach to the insurance market to ensure that appropriate cover is obtained at the best possible price. Experienced sponsors understand the importance of correctly approaching the insurance market. If not properly planned and controlled final insurance programme may be excessively expensive and potentially even unbankable when lenders assess the extent of cover.

The role of an insurance broker is essential in the placement of the insurance programme. Sponsors will usually appoint a single broker to manage the full insurance placement process. The broker will be responsible for presenting the project to potential insurance underwriters and will have a good understanding of the experience, capacity and competitiveness of the various insurers in the market for relevant risk cover.

13.5.4 Insurance in Oil and Gas Project Finance

Insurance is an important component of all project finance transactions and forms an essential element of lenders' security packages. Insurance thus attracts significant attention from lenders and can be a source of time-consuming

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8. Reinsurance is in fact a method of expanding the concept of risk pooling through the pooling of insurance pools. By doing this the insurance industry is in theory able to further diversify risks and hence improve efficiency.

negotiation during the structuring phase of a project finance transaction. The complexity of the insurance arrangements typically found in the oil and gas industry adds further to the challenges associated with structuring bankable insurance programmes. The capacity of the insurance market to cover the amount and type of risks involved in many oil and gas development project is often stretched. This is especially true for large offshore project developments. Furthermore, lenders to a project financing often impose specific requirements on the insurance programme. Lenders will want to ensure that the policy terms and extent of insurance cover are acceptable. Extensive negotiations can take place between the project sponsors, lenders and lenders' advisers over the appropriate level of cover. The issue is complicated as the scope of required cover can only be properly assessed once the exact risk allocation of the project has been understood. Once the residual risks are known then the availability and cost of procuring insurance to mitigate these risks can be better understood. Project finance lenders will also want to ensure that estimated maximum loss studies are independently verified.

Minimum Rating Criteria and Reinsurance Cover

It has already been noted that lenders will want to ensure that the credit worthiness of the insurers is acceptable. Credit rating criteria and minimum levels of reinsurance are usually imposed on the borrower. A typical minimum rating for an insurer in a project finance transaction is A− (from a competent rating agency) and lenders will usually expect at least 95% of any cover to be reinsured with insurers with the minimum rating.

Lender Interests and Security

Lenders will want to ensure that their interests in the insurance programme are recognised and protected. Provision will therefore be made for the lenders to be named as co-insured, for losses to be paid according to lender instruction, for there to be notifications of policy changes and cancellations of policies, and so on. Special provisions will be included to prevent insurance policy invalidity due to incorrect disclosure (non-vitiation) and to give lenders direct access to reinsurance policies (cut-through). The borrower will also make various covenants in the finance documents, which relate to insurance, including payment of premia, ensuring policies remain in place and so on.

Use of Insurance Proceeds

If a claim is made under an insurance policy for physical losses or damage then lenders will usually expect to be in a position to control of the use of the proceeds. This can be a source of considerable tension between the lenders and project sponsors. Lenders typically insist that insurance proceeds are paid into a segregated lender controlled account and the funds held in this account will be applied according to agreed mechanisms. Lenders will normally want to have the ability to apply amounts above a certain amount to prepay the project loans. The sponsors will usually insist, however, that amounts below a certain minimum level are applied to reinstate the damaged assets.

Upstream Insurance

Accommodating lender insurance requirements for upstream projects can be particularly problematic. The operator of an upstream joint venture is generally responsible for procuring insurance on behalf of the joint venture participants and will normally manage the insurance programme as part of its wider responsibilities pursuant to the joint operating agreement. Lenders to the joint venture partners will therefore have less control over the insurance programme. Furthermore it will often be impractical to include the usual project finance lender protections in the insurance policies. Although it may be possible for lenders to enter into some form of direct contractual relationship with the operator, this will depend on the particular circumstances and may not be successful in addressing the main areas of concern.

Project Finance Documentation and Insurance

The insurance provisions in a typical project finance loan agreements will usually be included in detailed insurance schedules in the documentation. These schedules can be extensive and can take a significant amount of time to be agreed by the parties.

13.6 UNFORESEEN EVENTS AND FORCE MAJEURE

The ability of the various parties to the project contracts to fulfil their contractual obligations is often impacted by unforeseen events beyond the control of the parties. A blockade of a port due to a striking workforce could, for instance, mean that an LNG offtaker is unable to load the cargo and hence offtake the product. Although under certain legal systems and in certain jurisdictions the party affected by unforeseen events may be able to claim relief from its contractual obligations, specific clauses are normally included in project contracts to deal with this situation. These clauses are known as 'force majeure' clauses and, by altering the risk allocation of the underlying contract, the terms of these clauses can have a significant impact on the bankability of a contract in the context of project finance.

There are no standard force majeure clauses and most of the terms are subject to a significant degree of negotiation. A typical force majeure clause begins by describing the events that constitute force majeure relief. These relief events usually include natural type events (unusual weather conditions, earthquakes, floods and so on) and political or politically motivated type events (strikes, riots, war, embargoes and so on). The consequences of a party being entitled to force majeure relief will result in that party's obligations being suspended. In addition, most commercial contracts will include other consequential impacts such as extensions of the contract term and allowance for additional time. The party claiming force majeure relief will typically be under an obligation to prove that the event does in fact constitute a force majeure and to mitigate as far as possible the consequences of the event.

The interaction of force majeure events in different contracts can have potentially significant consequences in project finance transactions. Differences in the definition and consequences of force majeure events in project contracts can result in a serious mismatch in the project company's obligations and liabilities under separate contracts. An LNG liquefaction project may, for instance, purchase gas from a third-party supplier pursuant to a gas supply agreement that includes unforeseen geological conditions in the definition of force majeure. If the supply of gas is curtailed due to reservoir difficulties then the gas supplier will likely claim force majeure relief and hence its obligations to supply will be suspended. If the project sells LNG to third-party buyers pursuant to contracts, which do not include gas supply disruptions in the definition of force majeure then the project could be exposed to significant liabilities for failure to supply LNG. It is thus essential to ensure that the consequences of force majeure events are consistently applied to project contracts otherwise the project company could be exposed to inappropriate risk allocation and bankability of project contracts could be seriously jeopardised.

Part III

Project Finance Applied to the Petroleum Industry

The aim of Part III is to apply the general project finance concepts that have been introduced in Part I to the oil and gas industry risks and commercial structures covered in Part II. We have seen that project finance is a flexible form of financing and that the risks and commercial structures encountered in the various sectors of the petroleum industry vary considerably. In the following chapters it will be seen that the adaptability and flexibility of project finance can be deployed to finance projects throughout the whole industry value chain.

In Chapter 14 we start by looking at the role of project finance in the oil and gas industry. It will be seen that, although the industry invests enormous amounts each year and that project finance has been used to fund some of the largest projects in the industry, the contribution of project finance to the petroleum industry is relatively small. In general, sponsors of oil and gas projects have shown great innovation and ingenuity in raising finance for their projects and a variety of hybrid financing structures are commonly encountered throughout the industry. Although not pure project financing, these structures share many features in common with the conventional project finance structures and will thus also be briefly examined in this Chapter.

Chapter 15 will then move on to explain how lenders analyse risk and assess bankability of projects in the oil and gas industry. The importance of lenders' due diligence is explained together with the use lenders make of various consultants and advisors to assist them in their analysis of projects. Following on, Chapter 16 will look in more detail at forecasting project free cashflows and analysing the risks that impact these cashflows. The role of financial modelling and the building of models for oil and gas projects will be reviewed. The importance of model outputs and their use in optimising debt structures will also be examined.

In Chapters 17 and 18, the approach that is adopted in structuring project finance transactions is then considered in more detail and applied to the major elements of the oil and gas industry value chain, namely the upstream, midstream and downstream sectors.

Finally, Chapter 19 will look at the documentation of an oil and gas project finance transaction. Once a bankable structure has been developed, the detailed terms of the financing must be fully documented in a legally binding set of agreements. The final part of this section of the book therefore examines the detailed structure of the project finance documentation and the processes typically followed to complete the financing.

Chapter 14

The Role of Project Finance in the Petroleum Industry

Chapter Outline

14.1 INTRODUCTION

The purpose of this chapter is to explain the role of project finance in the oil and gas industry and explore how this form of financing is used by project sponsors to raise capital. Although annual investment in the petroleum industry is enormous, it will be seen that project finance represents a relatively small source of capital for the industry. Oil and gas companies mainly utilise more conventional sources of corporate finance or internally generated funds. In certain circumstances, however, project finance is an attractive method of financing, notably for joint ventures or where project sponsors are targeting particular sources of specialist funding.

Section 14.2 considers overall investment in the global oil and gas industry and the fundamental factors that influence the levels of industry spending.

Although the upstream, midstream and downstream sectors of the industry have different investment characteristics and needs, the capital-intensive nature of projects is a common feature of each element of the industry.

Section 14.3 then goes on to look at how the industry's investment requirements are satisfied using traditional capital raising methods. The focus of this section is on internally generated funds, corporate borrowing and equity finance. A distinctive feature of oil and gas is the range of corporations operating in the industry. The traditional methods of fund raising for each different type of corporation will also be explored in this section.

Section 14.4 looks at the role of project finance as a source of capital for investment in the oil and gas industry. The reasons why the firms decide to use project finance and the performance of the oil and gas project finance markets are reviewed.

Finally Section 14.5 considers some of the hybrid-type structures which are often encountered in the industry. These structures are neither pure project finance nor pure corporate finance but lie somewhere in between.

14.2 INVESTMENT REQUIREMENTS OF THE PETROLEUM INDUSTRY

The petroleum industry is one of the world's largest industries and covers a vast range of activities. At its core, however, the industry is ultimately based on the extraction and utilisation of a depleting and finite petroleum resource base. An oil or gas well once brought on stream will at some point start to decline and merely maintaining existing levels of oil and gas production thus requires enormous capital investment. Pipelines, refineries, ships and petrochemical plants also require substantial investment whether to maintain existing infrastructure or to increase capacity in response to changes in supply and demand. Overall, the annual capital spending requirements of the oil and gas industry amount to several hundred billion dollars per annum. Although large, investment in the industry is also cyclical. Capital budgeting and investment planning are highly sensitive to both the prevailing and expected forecast oil and gas prices. A fall in the price of oil usually translates rapidly into capital spending cuts, delays in investment decisions and project cancellations. The recent dramatic falls in oil and gas prices and resultant severe spending cuts by all industry players provides direct evidence of this.

14.2.1 Investment in Upstream Oil and Gas

Investment in upstream exploration and production is required to find and produce new sources of oil and gas. Capital needs to be invested continuously in order to replace produced reserves. Adding to the challenge is the fact that searching for new petroleum resources often involves exploration and development in demanding and costly locations. As a result, the upstream sector has traditionally dominated the capital spending requirements of the oil and gas industry.

The large integrated oil and gas companies, for instance, typically spend several times more on their upstream activities compared to the downstream. In 2014 upstream spending by the major oil companies represented around 80 to 90% of total capital spending. Furthermore, over the last decade the costs of investment have increased dramatically. This is the result of a variety of factors. Industry costs have generally experienced significant inflation due to supply constraints and a general shortage of skilled human resources. Investment in unconventional resource development has also increased production costs. Overall, therefore, although cyclical and sensitive to oil and gas prices, the upstream industry requires significant and continuous capital investment for a wide range of different types of project in a variety of locations around the world.

14.2.2 Midstream and Downstream Investment

Investment is necessary in the midstream and downstream industries to fund new infrastructure and processing plant, expand and extend the life of existing facilities and deploy new technologies. Unlike depleting upstream assets, however, pipelines, ships, storage tanks, refineries, petrochemicals plants and the like are long-life assets. Some refineries operating today were, for instance, first built in the 1930s and incremental investment in existing plant has in many cases resulted in significant capacity increases.[1] The nature of investment in midstream and downstream oil and gas contrasts in many ways compared to the upstream industry. New investment in midstream and downstream infrastructure and facilities is usually associated with fundamental changes in supply and demand for oil, gas or petroleum products. These changes may come about for a variety of reasons, including the availability of new sources of raw materials, the development of new technologies, political pressures and so on. The abundant supply of low-cost petrochemical feedstock in the Middle East has, for example, resulted in substantial investment over the past few decades in new refining and petrochemicals capacity. Furthermore, improvements in gas liquefaction technology and the exploitation of new gas resources has meant significant investment and expansion of the fleet of LNG tankers over the past several decades. It can thus be seen that structural changes in the petroleum industry that impact supply and demand fundamentals can result in significant midstream and downstream investment requirements.

14.2.3 Factors Influencing Petroleum Industry Investment

In common with other industries, investment in oil and gas is principally driven by firms seeking opportunities to make profit. Profitable opportunities attract investment and, in turn, profitability is largely determined by demand, prices, costs and taxes. The main factors influencing investment in the oil and gas

1. The phenomenon whereby relatively minor increases in capacity take place over a number of years is commonly termed 'capacity creep' and is common feature of the refining industry.

industry, are thus the demand for energy, oil and gas prices, costs of production and government policies.

- *Demand for energy*: Demand for oil, gas, petroleum products and petrochemicals is largely determined by economic growth rates and rising living standards. A striking feature of the oil and gas industry over the last few decades has been the high levels of investment driven by the rapid economic growth rates in emerging newly industrialised economies, particularly in Asia. Many projects have been financed on the basis of demand growth in Asian markets. Investment in Middle East petrochemicals has, for instance, been driven to a large extent by Chinese demand for plastics and polymers. Similarly, increasing demand for transportation fuels in Asia has driven investment in new refineries.
- *Prices*: Although oil and gas prices are notoriously difficult to predict they have a fundamental impact on the level of investment in the petroleum industry. Short-term variability in oil and gas prices has a direct impact on industry cashflows and hence the ability of companies to invest. High oil prices generate strong industry cashflows and make project opportunities more attractive whilst in low oil price environments companies generate lower cashflows and projects are cancelled, delayed or postponed.
- *Costs*: Industry costs also influence investment. Higher cost projects are much more susceptible to changes in demand and prices. Technology can, however, have a significant impact on capital costs and hence the profitability of investment opportunities. Upstream technology, particularly in the extraction of oil and gas from unconventional resources, has had a transformational impact on the profitability of oil and gas production in certain parts of the world. Investment in US unconventional oil and gas production has been one of the most important phenomena in recent industry history. Technology has thus been a central factor in driving oil and gas investment throughout the history of the industry. This is an important issue for oil and gas project finance as many new investment opportunities are based on comparatively new developments in technology. The acceptability of new technology risk to project lenders is an important feature of oil and gas project finance and will be covered further in Section 15.4.2.
- *Government policy*: The approach adopted by governments to the industry, especially through taxation, has had a very strong influence on industry investment. High taxation in the upstream sector reduces investment and can bring forward the date for project abandonment. As a result, investment in the industry can be significantly reduced if governments raise the tax burden on projects. The UK government, for instance, has previously increased taxes significantly on the UK's offshore oil and gas industry. Not surprisingly, the impact of this was a market reduction in investment in the UK sector of the North Sea. Likewise, government policies towards emissions regulation and carbon pricing have had a significant impact on investment in the refining industry in Europe.

The aforementioned factors tend to influence the short and medium term investment outlook for the industry. In the longer term, other trends can have a more profound impact on oil and gas investment. The development of substitute technologies for energy generation and transportation together with the unsustainability of industry environmental impacts could dramatically affect investment in the sector, particularly given the long-term and capital-intensive nature of the industry.

14.3 CONVENTIONAL SOURCES OF FUNDING

Companies faced with funding decisions in the oil and gas industry have a range of options which fall broadly into three categories, namely internal funds, debt and equity. Corporate treasurers tasked with making funding decisions have several key goals when assessing alternative financing options, including lowest funding cost, most efficient capital structure, appropriate dividend policy and managing working capital and liquidity. The nature of the organisation making the investment decision, as well as the type of project being funded, will have a strong influence on the most appropriate funding decision. Although the industry has traditionally financed its investments using internal funds, the capitalisation of companies varies significantly depending on the types of organisation and the parts of the industry within which they operate.

- *Large integrated multinationals*: The large integrated oil and gas companies have historically maintained comparatively low levels of debt typically operating with gearing ratios of less than 40%. Given the size of these companies, however, even these low gearing ratios translate into significant monetary debt requirements. Although these organisations generate significant funds from operations and are usually able to finance investments from internal resources, maintaining dividends is a key objective. The volatility of earnings in the industry means that even the largest multinationals can be confronted with challenges in managing investment and financing cashflows. In general, however, these organisations have a wide range of funding options especially given investment grade credit ratings.
- *Medium-sized independents*: Medium-sized companies in the industry are more constrained in terms of their funding options. Independent upstream companies generate operating cashflows from oil and gas production and to grow they must continuously invest significant capital. The cashflows of these companies are more sensitive to oil price movements and hence they have greater dependence on debt finance, particularly loans raised on the basis of their underlying reserves base. Debt finance is also an important component of the funding structure of medium-sized midstream and downstream companies although the high volatility of refinery margins means that independent refiners often face challenges in raising debt.

- *Small independents*: The smaller companies in the upstream industry tend to focus on investment in exploration and generate limited free cashflow from producing assets. These companies, therefore, have significant constraints on their ability to raise finance and will typically look for equity or joint venture funding often using innovative structures, including farm-out agreements,[2] private equity, drilling funds and so on. Likewise, smaller downstream organisations also face significant constraints on funding and generally more challenging economics. These companies also make use of more innovative financing structures, including, for instance, securing finance against working capital.

The following sections will explain in more detail the characteristics the three major classes of corporate-level funding.

14.3.1 Internally Generated Funds

Internally generated funds represent a firm's accumulated resources that have been earned and retained from historical operating activities. The cashflows a firm generates from its operating activities can either be invested in cash, new projects, acquisitions or distributed to shareholders by way of dividends or share buy-backs. A company may, for instance, decide to distribute all of its operating cashflows to shareholders in the form of dividends. In this case, funding for investment will be sourced from third party borrowing or by raising additional equity finance. Alternatively a firm may decide not to pay any dividends and retain all of its operating cashflows to finance investment spending or accumulate cash. In practice most firms operate somewhere between these two extremes and a number of factors will influence the ultimate decision whether to distribute or retain surplus funds.[3] It is generally accepted, however, that for mature companies, which consistently generate surplus funds, the variability of distributions to shareholders over time can have an important impact on share prices and investor relations.

Although the larger companies in the oil and gas industry tend to use internally generated funds for investment in new projects, these companies will also want to ensure that as far as possible dividend payments are maintained over time. Given the correlation of industry operating cashflows to oil and gas prices, this requirement to maintain dividends can result in the rapid depletion of internal funds and hence pressure to either cut investment or raise funds from

2. A farm-out is an agreement whereby a licencee or concession holder (farmor) agrees to transfer a share of its interest to a third party (farmee). In return the farmee agrees to carry certain specified costs (usually service costs related, for instance, to the drilling and possibly completion of a well).

3. A firm's policy on distributions is known as its 'payout policy'. There are different views concerning the relevance of distributions to corporate valuation. In theory a firm's payout policy has no influence on its valuation. In practice, however, various factors need to be considered, including tax treatment of dividends, signalling effects and investor expectations. Further information on payout policy can be obtained from relevant corporate finance texts (see, for instance, Brealey et al. (2008)).

third parties. For smaller companies, the level of operating cashflow is generally much smaller. Exploration companies, for instance, often have negligible cashflows. Smaller companies are also typically committed to significant capital spending programmes and hence will usually want to retain surplus funds for investment. Distributions to shareholders are generally much lower and these companies will often place much greater reliance on third-party funding.

14.3.2 Corporate Debt and Oil and Gas Company Borrowing

Although for the industry as a whole internally generated funds represent the most important source of finance, companies also borrow on a large scale. In general, oil and gas companies have access to a wide range of corporate debt instruments, including bank loans, debt capital market products and institutional debt. The bank markets and capital markets allow oil and gas companies to borrow over a wide range of debt tenors in a variety of different currencies and with different repayment conditions and terms of financing.

- *Bank loans*: Corporate bank loans are typically short or medium term and offer repayment flexibility through revolving structures and bullet repayments. The availability of corporate bank debt for oil and gas companies depends to a significant extent on lending criteria that banks apply to the industry. Raising corporate funds can be challenging given that the risks throughout the petroleum value chain are high and often difficult for lenders to accept. Companies in the industry have, however, been able to develop innovative debt-financing structures for investment throughout the value chain. As a result, debt finance is used to fund all types oil and gas activity although less so for the larger integrated companies which have traditionally tend to finance the majority of their funding needs from internally generated resources.
- *Capital markets*: Access to competitive bond financing depends to a large extent on a firm's credit rating. The larger companies in the oil and gas industry tend to fund the majority of their debt requirements through the debt capital markets. Their investment grade credit ratings allow them to access long-term capital markets debt at highly competitive pricing and in a variety of different currencies. It is because of this strong reliance on the capital markets for debt funding that the large oil and gas companies are highly sensitive to ensuring that their investment grade ratings are maintained. Given the significant sums of money these organisations borrow from the capital markets, a rating downgrade will typically result in significantly increased finance costs. This will impact profitability and ultimately corporate valuations. An important determinant of corporate credit ratings is the balance sheet gearing ratio. The variability of operating cashflows and the importance of stable shareholder distributions has meant that the large oil companies have historically maintained relatively low gearing ratios. As already mentioned, the borrowing levels of the largest major oil companies

have rarely exceeded 40%. Although the major oil companies tend to maintain low gearing ratios, they still have substantial borrowings. The top four majors, for instance, borrowed between them around US$ 100 billion[4] in 2014 using a variety of different types of debt finance, including bank loans, bonds and other capital markets instruments.

Overall, therefore, bank and bond debt finance is an important source of capital for the international petroleum industry and a wide range of different types of debt finance is available. Bank debt, in particular, is a highly flexible method raising corporate funds particularly for established borrowers in the industry.

14.3.3 Equity Funding for the Oil and Gas Industry

Equity is an important source of long-term capital for the oil and gas industry. Corporations raise equity by issuing shares to investors, each share representing an ownership interest in the company entitling investors to voting rights and dividends.[5] Any repayment of share capital and the payment of dividends are at the company's discretion and hence share capital represents a permanent and flexible source of funds allow firms to manage cashflow volatility. Equity can be raised in various forms, each having its own features and characteristics. The details of the different types of equity instrument will not be covered in this text. It is, however, important to understand the broad distinction between public and private equity.

- *Public equity*: The listing of shares on a stock exchange allows companies to access a wider pool of investors and is generally regarded as being beneficial to a firm's reputation. The public equity markets represent an important source of funding for many companies in the petroleum industry. The large integrated oil and gas companies are amongst the largest listed enterprises on many of the world's public exchanges, in many cases collectively representing a significant share of stock market valuations. Public exchanges are also important sources of funding for smaller companies in the oil and gas industry. The shares of these firms tend to be listed on smaller exchanges which provide a market for the shares of companies that do not qualify for listing on the major exchanges. This may be because a firm is too small or has insufficient track record to fulfil the full listing rules. The London Stock

4. See 2014 relevant annual reports for ExxonMobil, Chevron, Shell, Total and BP: ir.exxonmobil.com/ phoenix.zhtml?c=115024&p=irol-publanding, www.chevron.com/investors/financialinformation/, www.shell.com/global/aboutshell/investor/financial-information.html, www.total.com/en/investors/results/2015/second-quarter-2015-results, www.bp.com/en/global/corporate/investors/annual-reporting.html

5. Equity capital is not only a source of finance but also determines the ownership structure of a company and hence the ongoing management of corporate activities.

Exchange's Alternative Investment Market (AIM) has, for instance, been one of the most important sources of equity funding for smaller exploration and production companies.

- *Private equity*: A variety of private investors provide equity capital to companies in all sectors of the petroleum industry. Some of these sources of private equity are investment funds which provide finance for companies in a variety of sectors and at different stages of development. Many of these funds will have specific investment criteria and will also generally attach conditions to their investments, include representation on boards and involvement in decision-making. Larger companies may also raise equity capital through private placements. Private placements are generally arranged through an investment bank which buys the shares and sells them on to selected clients.

The public and private issuance of equity is often the only option available for exploration companies. As we have seen, these firms typically have limited debt capacity due to lack of cashflow from production. Equity issuance through public seasoned offerings and rights issues[6] is an option for more established and larger companies. The viability and cost of equity issuance is, however, influenced to a great extent by investor confidence. New issuance and rights issues on public exchanges have become increasingly difficult for firms in the oil and gas industry due to the volatility of oil and gas prices and the perceived riskiness of the sector. As a result, despite the importance of equity finance as a source of funding for oil and gas industry investment, the relative share of equity is low compared to internally generated funds and corporate debt finance.

14.4 THE ROLE OF PROJECT FINANCE

The traditional sources of corporate debt, public and private equity and internally generated funds have provided the majority of the oil and gas industry's capital requirements. In contrast, and compared to other industry sectors, project finance is less widely used. The structuring and execution of project finance transactions for oil and gas projects is considered to be expensive, burdensome and time consuming. In addition, the risk profile and volatility of the project cashflows mean that oil and gas project finance is more difficult for lenders to assess in comparison to other more predictable industries. Despite these apparent disadvantages, however, project finance techniques have been successfully used to fund oil and gas projects in all parts of the industry and for all types and sizes of sponsors. Several significant and high-profile projects have raised very large amounts of project finance debt. Indeed investment in a number of areas of the oil and gas industry sectors has been dominated by project finance, the most notable being the LNG sector.

6. Companies that are already listed can issue additional shares through seasoned offerings. A rights issue is a particular type of seasoned offering whereby the existing shareholders are given priority rights to the new shares.

14.4.1 Oil and Gas Project Finance

Project finance techniques allow funding to be tailored to the specific risk profiles and cashflow characteristics of particular projects. As a result, project finance is an extremely versatile method of funding which in theory can be used to fund almost any type of project. In contrast to many other industries, the risks and economics of oil and gas projects vary significantly throughout the sector. The adaptability of project finance explains why this form of funding has been used to finance projects throughout the industry value chain. In addition, a number of the general features of project finance are particularly beneficial to project sponsors in certain circumstances.

- The ability to achieve high gearing and reduce cash equity commitment. This is especially attractive in joint ventures arrangements, particularly if certain partners are cash constrained.
- The ability to structure risk sharing arrangements that allow project sponsors to transfer project risks to third parties and project lenders. Sharing of political risks with third-party lenders is particularly attractive in certain jurisdictions. Governments may be less willing to interfere with projects which have debt obligations to international banks, multilaterals and so on.
- The ability to access specific sources of funding, including export credits, multilaterals, Islamic finance and local bank funding.
- The ability to match financing terms to project cashflows. Project finance loans, for instance, will normally allow extended principal grace periods and capitalisation of interest during the construction period and extended debt tenors to match the operating cashflows of the project.

Project finance allows sponsors to raise funding on the basis of the future performance of a specific project and, as already seen, the ability to match funding to project cashflows usually means that project finance gearing ratios are higher than normal compared to corporate balance sheet ratios. By designing the finance structure to match project risks and economics, project finance thus allows sponsors to raise significantly more debt than would otherwise be possible. This is especially important for sponsors whose access to capital is restricted or constrained. As a result, project finance can allow projects to be developed by entities which would otherwise not have access to more traditional sources of funds. Oil and gas industry joint ventures often include financially weaker partners, especially government related entities and smaller independent sponsors. In partnership with larger and better-rated entities, significant financial benefits can accrue to the weaker project sponsors by unlocking finance which would otherwise not be available.

Project finance also allows sponsors to share project risks with other parties, including lenders. When raising funds for oil and gas projects in challenging jurisdictions, for instance, the project sponsors may be willing to pay additional funding costs to limit their exposure to country risks. Provided the additional cost of loans is acceptable given the transfer of risks, project finance can be a useful method of project risk management.

14.4.2 Project Finance Performance and Precedent Projects

In Chapter 3 the global project finance markets and the role of project finance in the context of the wider financial markets were covered. We saw that project finance is a relatively small market with transaction values totalling approximately US$ 250 billion per year. In 2014 oil, gas and petrochemicals project finance totalled almost US$ 80 billion, which is equivalent to at most around 10% of total petroleum industry investment per year. It is important, however, to understand the nature of the projects which have been funded using project finance techniques. It will be seen that project finance has been used by many of the largest organisations in the industry. Furthermore, some of the largest and most important oil and gas projects have been financed using project finance techniques. Table 14.1 illustrates the historical record of oil and gas project finance.

TABLE 14.1 Historical Record of Oil and Gas Project Finance

2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
31,001	46,631	42,725	51,836	28,437	37,257	43,450	64,652	50,281	77,195

Over the past decade the oil and gas project finance market had fluctuated significantly between a low of US$ 28 billion in 2009 to a high of US$ 77 billion in 2014. The level of activity in any year is usually strongly influenced by a small number of significant transactions. For instance, 2012 and 2014 were particularly strong years due primarily to the closing of a small number of large LNG and downstream project finance transactions.

The following examples of notable project finance transactions closed in each of the main sectors of the oil and gas industry illustrate the importance of this form of financing.

Upstream Projects

It has been explained in Part II that the risk profile of the upstream oil and gas industry has historically been difficult for lenders to accept. Many of the commercial and contractual structures commonly encountered in the upstream sector raise challenging issues for project finance lenders, particularly the common occurrence of unincorporated joint ventures. Despite the hurdles, however, project finance techniques have been used to finance many upstream projects, especially in the gas and LNG sectors which tend to have longer-term and predictable contractual arrangements. Some examples of very large and successful upstream project finance transactions include:

- Qatargas[7] and RasGas[8]: The LNG industry in Qatar has been financed almost exclusively using project finance. Qatargas and RasGas are joint venture projects which together produce around 72 million tonnes of LNG from 15 LNG trains located at Ras Laffan Industrial City in Qatar. Project finance debt of over US$ 15 billion has been successfully raised from a variety of sources for these projects.
- Ichthys LNG[9]: This is an offshore gas and condensate field development project in Australia and includes an 889 km offshore gas pipeline and an 8.4 million tonne per annum onshore liquefaction plant. US$ 20 billion of project finance debt was raised for this project which represented the largest project finance loan ever closed.

Project finance techniques have also been used to raise funds for smaller upstream development projects in a variety of challenging locations, including the North Sea, West Africa and Siberia.

Midstream Projects

A number of the largest oil and gas infrastructure projects have also been financed using project finance techniques.

- Nord Stream[10]: This is a twin pipeline gas export project with a capacity of 55 billion cubic metres per annum. The pipeline runs from Vyborg in Russia to Greifswald in Germany. Two euro denominated project finance loans totalling € 6.7 billion were used to fund the two separate phases of the project.
- Baku–Tbilisi–Ceyan[11]: This is a 1768 km pipeline which transports oil from the Sangachal terminal in Azerbaijan through Georgia to the Ceyhan export terminal in Turkey. The project was financed using an approximately US$ 2.5 billion multi-sourced project finance structure.

In addition to pipelines, other infrastructure including oil and gas storage facilities, import terminals and the like have been successfully project financed. Project finance techniques have also been used more frequently to fund offshore infrastructure, particularly floating structures. In fact, project finance is now a well-established source of funding for FPSOs and similar offshore facilities. Finally, finance for the petroleum shipping sector shares many features in common with project finance. For dedicated and specialist vessels the underlying

7. www.qatargas.com
8. www.rasgas.com
9. www.inpex.com.au
10. www.nord-stream.com
11. www.bp.com/en_az/caspian/operationsprojects/pipelines/BTC.html

commercial rationale, risk profit and economics of the underlying project strongly influence financing structures and project finance methods have been successfully applied to these types of transaction.

Downstream Projects

Project finance has been widely and successfully used to fund investment in refineries, petrochemicals and other downstream projects. A long and extensive track-record has been established in downstream project finance involving a wide range of different types of project throughout the world. The Middle East has been a particularly prolific source of project finance opportunities in both refining and petrochemicals, largely as a result of cheap and abundant feedstocks. In Saudi Arabia the industrial cities of Jubail and Yanbu have over the past few decades developed into large manufacturing sites for petrochemicals and refined products. The investments made into the downstream oil and gas sector in both of these cities has been enormous and much of this investment has been funded through project finance loans to joint venture subsidiaries of Saudi Arabian and foreign enterprises. Qatar, Oman and Kuwait have, likewise, raised project finance for refining and petrochemical projects. Downstream project finance has not, however, been restricted to the Middle East. Refinery and petrochemicals projects in Eastern Europe, Russia, Vietnam, China, India, Latin America and, most recently, the United States have raised project finance.

Overall project finance has performed a vital function in many aspects of the petroleum industry value chain. Some of the largest and most complex investments in the global oil and gas industry have been funded using project finance techniques and a strong body of precedent now exists upon which sponsors and their advisers can build structured financing for new projects.

14.5 HYBRID FINANCE STRUCTURES FOR THE PETROLEUM INDUSTRY

Structured and hybrid financings share many features with traditional project finance transactions but, due to specific structural characteristics, cannot be classified as 'pure' project finance. Hybrid finance structures are used for a variety of reasons, including to accommodate unusual cashflow profiles, the pooling of multiple project risks, tax optimisation, special accounting treatment or managing issues associated with security perfection or regulation. Although there is an almost unlimited range of different structures that could be developed to accommodate specific requirements, hybrid finance structures for oil and gas projects commonly fall into one of the following categories.

14.5.1 Production Loans and Forward Purchase Facilities

Production loans are debt facilities made to borrowers in return for which lenders receive rights to the underlying petroleum reserves. The loan principal and interest is serviced from the proceeds of sale of production. Forward purchase facilities or prepayment facilities involve a special purpose company being established which pays for agreed quantities of future production by way of an upfront payment equivalent to the amount of the loan. These loans are made to existing production and lenders rarely take development risk. In return for making the advance payment the borrower then receives delivery of production which it then on-sells to final customers. The proceeds of the ultimate sale are used to service debt.

14.5.2 Pre-Export Financing

Pre-export financing is a further variation on the concept of a production loan. Pre-export financings are based on a structure whereby a loan is repaid from the proceeds of export sales made by a producer to offtakers pursuant to pre-agreed export sales contracts. The lenders to a pre-export financing typically take security over the export contracts and the cashflows from the sale of production will normally flow through lender-controlled accounts. Compared to project finance loans, pre-export facilities are generally for shorter periods and are used to raise funds from existing production rather than to finance the costs of project development. In addition, the loans are often made to existing companies rather than special purpose project borrowers. Pre-export finance loans are, however, similar in many ways to project finance loans. Lenders are normally exposed to product price risks and varying degrees of production and reserve risks. Given that debt is repaid from the proceeds of sales to a third-party offtaker, lenders are also exposed to the credit risks of the offtaker. Pre-export finance may also include mitigation structures that are commonly found in project finance, including price and interest rate hedging, credit support for offtakers, reserve accounts and so on.

14.5.3 Inventory Financing

Inventory financing involves raising funds on the basis of lenders taking security over the stocks of raw materials or petroleum products. The value of stocks of raw materials and petroleum products is usually significant (and in some situations can actually be more valuable than the project assets themselves). The value of crude oil and refined product inventories are considerable for a refinery project. Thirty days crude oil inventory for a 200,000 barrel per day refinery assuming US$ 60 per barrel is equivalent to US$ 360 million. Inventory thus represents a potentially attractive form of security which can be used to raise capital. In fact crude oil and refined product inventory is often excluded from project finance lender security packages and subject to separate security and financing arrangements.

14.5.4 Tax or Fiscal Based Financing

It has already been mentioned that governments often use tax systems and fiscal regimes to incentivise or disincentivise investment behaviour. This is especially relevant to the upstream industry as many governments try to ensure that companies are incentivised to develop particular types of project which, under the general taxation system, may otherwise not be developed. The nature of the tax system may therefore present financing opportunities and financing structures have often been developed to take full benefit of the particular tax regime. There is almost an infinite variety of financing structures that could be developed depending on the nature of the applicable tax regime. An example of this is the Norwegian treatment of exploration costs. The Norwegian tax policy allows companies to claim reimbursement for a fixed proportion of exploration expenditure on an annual basis. A variety of loan facilities have been made to companies operating on the Norwegian continental shelf, which use as their basis of repayment the refunds from the Norwegian governments.

14.5.5 Borrowing Base Facilities

A borrowing base is a concept whereby a loan is made on the basis of the value of a portfolio of assets which are secured to the lenders. In the context of oil and gas financing, the borrowing base assets are oil and gas reserves which are valued on the basis of the net present value of future production. Borrowing base facilities and reserve-based lending are important techniques for funding upstream projects. There are a variety of different types of structure for these financings, some of which are very similar to traditional project finance whilst others are much more closely related to corporate financing. Given that several of these financing structures are closely related to project finance, the characteristics of these facilities will be examined in more detail in Section 18.2.4.

Chapter 15

Risk Analysis and Bankability for Oil and Gas Projects

Chapter Outline

15.1 INTRODUCTION

The principal risks and commercial structures commonly found in the various sectors of the oil and gas industry have been covered in Part II. The purpose of this chapter is to look in more detail at the approach lenders typically adopt when assessing project finance risks in this industry. In general lenders have traditionally taken the view that, compared to other sectors, loans to oil and gas projects involve greater exposure to higher and more challenging risks. Furthermore, given the high debt levels associated with project finance, lenders normally adopt a more conservative stance towards industry risks compared to project sponsors. Sponsors often find the cautious approach taken by lenders difficult to comprehend. It is, however, vitally important to recognise that lenders are unlikely to accept risks that they are unable to adequately assess or control.

Section 15.2 examines how lenders approach the analysis of petroleum industry risks. It is important to understand the processes that lenders go through and the parties involved in analysing project risks. As the assessment of risks in the industry generally requires specialist skills and hence lenders rely to a great extent on third-party experts. Selecting, appointing and managing these experts is a centrally important part of the overall project finance process.

Section 15.3 then leads on to consider perhaps the most important factor in determining the bankability of a project namely the risks associated with the project sponsors. Lenders are not in the business of managing petroleum projects and they will look to the skills and resources of the project sponsors to deliver a successful project. Unless lenders can be convinced that the project sponsors have sufficient experience, financial resources and, above all, commitment then the bankability of the transaction is likely to be highly questionable.

Section 15.4 looks in more detail at how lenders assess and approach oil and gas industry risks. Although lender risk appetite has a tendency to change over time, certain common themes can be identified. These themes will be introduced in this section and should provide a basis for primary assessment of risk bankability.

Section 15.5 then considers various structures and techniques commonly used to mitigate risks.

15.2 LENDER ANALYSIS OF OIL AND GAS PROJECT RISKS

When negotiating project finance transactions, it is often easy to forget that the lenders are in the business of lending, not oil and gas. Furthermore, each lending institution will have different objectives in mind when deciding whether to extend credit to a particular project. The lending activities of commercial banks, for instance, cover a wide range of industrial sectors, including leisure, retail, property, manufacturing, construction, automotive and so on. The principal aim of banks in making loans to borrowers in these different industries is to earn profits for their shareholders. In contrast, ECAs are concerned with the promotion of a nation's exports whether these are aircraft, industrial equipment or other products. Multi-lateral agencies, on the other hand, are focused on country development through the promotion of investment in an equally broad range of activities. Although oil and gas is one of the world's largest industries it may not be a significant area of activity for particular institutions. As a result, the capabilities and experience of lending institutions in the petroleum industry vary considerably and this will inevitably impact the approach that an individual lender will take towards oil and gas industry risks.

Institutional lending policies will often dictate the ability of a particular lender to extend credit to a project. The setting of policies and guidelines is an important element of lending business risk management and if a proposed transaction involves risks that are contrary to an institution's internal policies then no amount of negotiation will result in a loan commitment. Lending guidelines are often produced for particular industry sectors and for the oil and gas industry could cover the following areas:

- The acceptable level of reserves and geological risk. Many lending organisations will rarely consider lending to anything other than proven reserves.
- The recommended approach to project development and completion risk. Some institutions and investors will not accept project completion risks. Bond investors are, for example, particularly sensitive to these risks.
- The acceptability of project sponsors. Most institutions will set minimum criteria against which they assess the strength of project sponsors. In addition, the relationship and track record that sponsors have with lending institutions is an important factor in determining lenders' approach to sponsor risks.
- The acceptable levels of market risk and price risk. Some institutions may, for instance, have strict internal guidelines on the appropriate forecasts for future oil and gas prices.[1]

It has been known for industry sub-sectors, geographical areas or types of structure (even including project finance itself) to be severely restricted or even prohibited in lending policies and guidelines. As a result it is essential to understand at an early stage the specific policies and guidelines that are applied by particular institutions to the oil and gas sector. Unfortunately lender risk appetite is not a constant concept. Risk appetite varies over time largely as a function of general market conditions. Risk appetite also varies according to the source of debt. Commercial banks may take a wider view of their relationship with particular sponsors and hence may be willing to accept more risk. Institutional investors and bond investors on-the-other-hand tend to show much less flexibility. Furthermore, ECAs and quasi-government lenders may have very strict institutional constraints that are imposed upon them through their governing constitutions. A great deal of judgement is therefore required to understand whether a particular project is bankable. There are many examples of project finance transactions having failed due to the sponsors being overly optimist with regards to lender risk appetite. Considerable time, effort and cost can be spent on devising project finance structures which ultimately fail. It is because of this that even the largest and most sophisticated sponsors generally engage financial advisers to help structure projects. The following sections examine in more detail the lender processes and the role of financial advisors and external experts.

15.2.1 Lender Approach to Oil and Gas Bankability

The general approach that lenders normally take to risk analysis, due diligence and bankability has been covered in Section 1.4.2. For oil and gas

1. 'Price deck' is a term commonly used to describe the future outlook for oil and gas prices adopted by lenders and other institutions.

projects, the due diligence process will usually last for an extended period of time and due diligence activities will often dominate the early stages of a project finance transaction. We have, however, seen that lending institutions are involved in a broad range of activities and many do not have the level of specialist expertise necessary to undertake sophisticated analysis of oil and gas industry risks. An important feature of lenders' approach to risk analysis is thus the involvement of a range of independent petroleum industry specialists, consultants and experts to advise lenders on the acceptability of project risks. In many cases, the bankability of a risk can depend to a large extent on the opinion of a particular consultant. Substantial sums of money in terms of guarantees, support arrangements or even lending commitments may be determined by a few pages of analysis in a due diligence report. It is thus important to ensure that the work of the various due diligence consultants is properly controlled and managed.

The lender due diligence process can often have a significant impact on the commercial and financial structure of a project. Lenders' assessment of project risks can diverge considerably from that of the sponsors. Lenders may require more redundancy in project design, including, for instance, the drilling of additional production wells or installation of back-up utility systems. Alternatively lenders may insist on a greater level of completion risk transfer to a contractor. These additional risk mitigation measures can result in significantly higher development costs (and hence directly impact sponsor returns). If project finance is likely to be used to fund a project, the sponsors must bear in mind the possible requirements of lenders and the impact that this can have on cost and risk transfer. Before embarking on detailed contractual negotiations or finalisation of project designs, an assessment of the bankability of the project should be undertaken. The costs of re-opening the negotiation of the major project contracts or undertaking a redesign of core elements of the project can be extremely expensive and time consuming.

15.2.2 Negotiating and Working With the Lenders and Their Advisors

At some point during the project development process the project sponsors will need to approach potential project finance lenders and begin working with these institutions on the structuring of the financing. Sponsors can work with lenders in a number of different ways depending on the specific circumstances of the project and the experience and preferences of the sponsors. The two most common types of approach are the negotiated deal and the competitive auction.

- *Negotiated process*: This approach involves the project sponsors engaging with a small group of relationship banks at an early stage of the project. These lenders are commonly called 'arrangers' or 'pathfinders'. The project sponsors and lenders will then work together through the preliminary stages of project development to structure a satisfactory financing. The ultimate aim is to sign the loan agreements at the same time as the major construction contracts. This type of arrangement is often adopted with non-standard projects for which there are few precedents or with unique or difficult risk profiles. Sponsors with less experience in project finance also tend to prefer to engage with lenders at an early stage.

- *Competitive process*: This approach involves the sponsors structuring the financing themselves and presenting the financing opportunity to lenders at a later stage in the project development process. If structured correctly the sponsors can often present the financing opportunity on a 'take-it-or-leave-it' basis to a wide group of potential lenders. The lenders will be provided with a full financing package, including due diligence reports, cashflow models and fully developed term sheets and they will be asked to submit proposed commitment amounts and loan pricing.

The negotiated and competitive bid approaches both have benefits and risks and neither is perfect in all circumstances. In the negotiated approach, by working with relationship banks early the project sponsors can become committed to particular structures or financing terms which turn out to be too conservative or restrictive. The sponsors can become progressively more dependent on the promises made by the lenders and can find it difficult to make changes to commercial structures or contracts. The lenders can in effect take over control of the project. In general the negotiated bid is more expensive and can lack competitive tension. On the other hand, sponsors adopting the competitive bidding approach run the risk that the structure will not be accepted by prospective lenders. The sponsors need to ensure that they have developed a financing package that is bankable otherwise elements of the deal will have to be renegotiated. From a lenders perspective, however, it is far better to be presented with a bankable structure which requires minimum structuring and can be presented to credit committees without significant additional working.

Financial Advisors for Oil and Gas Projects

The roles and scopes of work of financial advisors have already been introduced in Section 1.6.3. Given the complexity of most oil and gas project finance structures it is invariably the case that project sponsors engage an advisor at an early stage. A competent financial advisor should be able to develop a bankable financing structure that will allow the project sponsors to approach prospective lenders on a competitive bidding basis. The cost of a good advisor is usually more than covered by the lower cost of financing which is usually possible through a competitive bidding process.

It is common in oil and gas project finance transactions for the advisor's work to be phased. Sponsors often engage an advisor in the initial stages of project development to undertake a preliminary advisory assignment. This will usually involve the preparation of a bankability study to identify the key project risks and the best methods of allocating and/or mitigating those risks. The financial advisor is also likely to prepare a preliminary financial model and review the current state of the financial markets to advise on potential sources of finance. This preliminary work can then be used as a framework to develop the commercial structure of the project and the key terms of the major project contracts. The preliminary financial advisory mandate is followed by a full scope mandate which will include preparation of a full information package for lenders, negotiation of a long form term sheet and management of the due diligence process.

A financial advisory assignment for a large, complex oil and gas project is usually an onerous undertaking and the advisor will need to have oil and gas industry expertise and experience in dealing with different types of lender. Although different firms act in a financial advisory capacity, oil and gas financial advisory tends to be dominated by the large international banks. Given that these banks also expect (and are expected) to take a leading role in the lending to the project, issues can arise over conflicts of interest. The fees earned on a financial advisory assignment are likely to be relatively small compared to the fees earned on lending. There are a variety of different ways that sponsors and banks tend to deal with this issue although fundamental to all is a requirement to ensure that there is a separation of lending and advisory activities on any particular transaction within the institution concerned.

Lenders' Experts, Advisors and Consultants

Lenders to oil and gas projects will engage the customary selection of project finance advisors namely legal, market, environmental, insurance and technical. In addition, lenders may require specialist advice and due diligence on specific aspects of the project, including shipping, tax and possibly even physical security (including the risk of terrorism, political unrest and so on).

In assessing upstream oil and gas projects, lenders will want to undertake due diligence on sub-surface risks and the reliability of reserves estimates. Although a number of institutions employ their own in-house sub-surface specialists, these individuals will normally work alongside an external firm of petroleum engineers which will be retained (and owe a duty of care) to the wider group of lenders to a particular project. In addition to providing lenders with a detailed commentary on the sub-surface risks of a particular project, reserves consultants will also be expected to provide certification of the reserves and production profiles. The scope of due diligence work will normally extend throughout the life of the loan, especially if the finance structure is based on regular redeterminations of reserves as part of a borrowing base structure.

The various lender consultants should in theory be directly engaged by the lenders with the project sponsors bearing the associated costs. This is not a problem once the documentation has been signed. The normal practice is for the agent bank, borrower and consultant to sign engagement letters at the same time as all other documentation is signed. The situation is more complex prior to signing of the finance documents as the lender group has yet to be formed and hence the consultants have no ‘client’ for whom to act. There are two ways of dealing with this issue. Either the arranging banks individually appoint and instruct the various consultants prior to signing or the financial advisor takes responsibility. It is usual practice in the larger and more complex deals for consultant engagement to be handled by the financial adviser on the understanding that, in carrying out the work, the consultants owe their duty of care to the lenders.

An important consideration when dealing with the lender due diligence process and working with lenders’ advisers is the nature of information that will need to be disclosed. Certain information is often sensitive and the management of confidential information needs to be carefully considered. Sales and marketing arrangements, including pricing formulae, may, for example, be commercially sensitive. Likewise proprietary technical information can be extremely valuable in the hands of competitors. Unless lenders have sufficient information, however, it may not be possible for them to conclude on the bankability of particular risks. There is a balance, therefore, between the extent of information disclosure and the ability of the lenders and their advisers to make informed judgements on the acceptability of risks. Compromise solutions to the problem have generally been found. In a number of LNG project finance transactions, for instance, commercially sensitive pricing formulae have been withheld from the lenders and consultants. To ensure consistency between the base case forecasts and sales contracts, however, the model auditor has been given sight of the formulae and confirms consistency to the lenders.

15.3 SPONSOR RISKS IN OIL AND GAS PROJECT FINANCE

Although the aim of project finance is to raise funds without recourse to the sponsors, lenders will nonetheless attach great importance to project sponsorship. Weak project sponsors can threaten the viability of a project financing and the acceptability of the project sponsors is invariably one of the first issues that lenders will want to assess. Joint venture structures further complicate the assessment of sponsor risks. When dealing with a diverse group of joint venture partners it can be difficult to properly evaluate the impact of weaker sponsors on the overall risk profile of the project. Lenders will therefore need to understand the nature of the joint venture arrangements and be satisfied with the long-term sustainability of the relationships. The following sections firstly consider the long-term commitments that lenders expect from project sponsors. Secondly the experience and expertise of the sponsors will be examined and finally the sponsor financial risks to which lenders are usually exposed will be considered.

15.3.1 Sponsor Commitment and Lending Relationships

There are very few circumstances whereby the lenders to a project will accept anything other than long-term commitments from the core project sponsors. Lenders are usually wary of project sponsorship that appears short-term or opportunistic. This will typically mean that, at the very least, the sponsors commit to maintaining a minimum ownership interest in the project throughout the life of the loan. In addition, key sponsors are often expected to provide technology, expertise and human resources for extended periods.

An effective way of assessing sponsor commitment is to consider the relevance and importance of projects to sponsor strategies. Projects that clearly form part of a coherent long-term corporate strategy are more likely to retain strong sponsor commitment. The drive by domestic firms in the Middle East to invest in the development of petrochemicals projects is not difficult to understand as part of their strategies to utilise abundant and low-cost feedstocks. Likewise, investment in LNG projects by the major oil companies can be understood in the context of their strategic goals to expand their natural gas businesses. In contrast, if a project represents a move by a sponsor into a new sector or geography then a clear strategic rationale needs to be properly communicated to the lenders.

Closely related to the sponsors' strategic rationale for a project is the relationship the sponsors have with potential lenders. Sponsors will want to ensure that the leading lenders to their projects also share a long-term commitment to the project and fully understand the strategic rationale for the investment. Most corporations maintain close long-term relationships with a small group of core relationship banks and it is these banks that normally play the leading roles in structuring a project financing. Sponsors will typically select the financial adviser from their mutually agreed list of core relationship banks. The sponsor relationship approach adopted by commercial banks to project finance transactions is one of the reasons why these institutions have occupied such an important position in the development of project finance. Maintaining long-term sponsor relationships is of much less importance to other lenders such as bond investors, export credit agencies and so on.

15.3.2 Experience and Capabilities

Success in the petroleum industry demands competent management of a wide range of complex and difficult risks. The consequences of failure are high especially given the hazardous and environmentally damaging nature of many industry operations. The long-term viability of oil and gas projects therefore depends to a large extent on the experience and capabilities of the project sponsors to manage complex risks in a highly competitive environment. Project lenders will want assurance that the entities sponsoring any particular project have sufficient experience, capabilities and track record to deliver a successful venture. It is not, however, only the skills and experience of the individual sponsors that are important. The various sponsors within a consortium or joint venture often contribute specific expertise in particular areas. It is very common for international companies to form joint ventures with local partners, each partner bringing invaluable expertise and capabilities without which the project would not succeed. When assessing the experience and capabilities of sponsors, lenders will, therefore, need to consider the relationships between all of the sponsoring parties and their ability to manage joint venture arrangements.

Given the diverse range of sponsor involvement in individual projects there is great scope for conflicts of interest to arise. A sponsor acting as sole marketer for a particular speciality petrochemical product, for instance, will usually face conflicts when negotiating the marketing agreement. Likewise, a state-owned company will inevitably face conflicts of interest when negotiating or disputing the terms of a licence or production sharing agreement with a host government. These potential conflicts can become extremely difficult to resolve and in certain circumstances may result in the failure of the project to successfully raise project finance. Sponsors and lenders therefore need to be aware of the difficulties that conflicts of interest can present. Mechanisms can usually be incorporated into commercial and financial agreements to limit the impacts of conflicts (by, for instance, excluding relevant sponsors from certain decisions) but these require flexibility and understanding to ensure an acceptable compromise is achieved. There is little point in agreeing commercial arrangements which leave open sponsor conflicts in the expectation that project finance lenders will accept the position. It is highly unlikely that a financing will succeed if the core sponsors are negotiating from a conflicted position.

15.3.3 Sponsor Financial Risks

Oil and gas project finance demands substantial equity commitment from the project sponsors. The equity component of a US$ 10 billion project will usually amount to at least US$ 3 billion. Furthermore, projects rely not only on sponsor equity funding but also other forms of financial support, including contingent funding and possibly even debt repayment pursuant to a completion guarantee. Projects may also be financially exposed to sponsors as a result of commercial arrangements between the project company and the sponsors. Take-or-pay commitments under long-term sales and purchase agreements are especially important in this regard. An important element of lender risk assessment will thus be to establish whether the sponsors have the necessary financial capacity to honour their funding commitments. The following three steps are usually followed to manage the sponsor financial risk exposure.

- *Quantify the monetary exposure*: The first step is to determine the maximum likely exposure of the project and the lenders to each project sponsor. This exercise will involve examination of the various obligations which the sponsors have pursuant to the financial and commercial agreements.

- *Analyse the credit-worthiness of the sponsors*: The second step in determining the acceptability of sponsor financial exposure is to analyse the credit standing of the sponsors themselves. Lenders are in the business of analysing corporate credit risk and undertaking this analysis for the sponsors of project finance transactions is no different. The complexity for project finance loan officers is that they must perform this assessment on all the project sponsors, some of which may not have a track record in international borrowing.
- *Mitigation of unbankable exposures*: The third step in this process is to mitigate or enhance any unbankable exposures. This could take the form of standby letters of credit, upfront funding, cash collateralisation, carried exposures and so on. The financing structures may also include rating triggers or cross defaults that act as early warning signs for sponsors running into financial difficulties. The negotiation of these mitigation measures can be highly contentious given that they often involve significant cost and will often not impact all sponsors equally.

In certain cases it may not be possible to mitigate the financial risk of an individual sponsor to an acceptable level. As a last resort, the other project sponsors may be required to cover certain joint venture partner financial risks, especially if the project involves a financially weak state entity.

15.4 LENDER APPROACH TO PROJECT RISKS

The assessment of risks determines not only whether lenders are prepared to extend credit to a project but also the terms upon which they are prepared to lend. It goes without saying that the higher the risks, the lower the amount of debt and the tighter the terms of lending. Ultimately, for an institution to make a loan to a project, the transaction will need to pass through a variety of internal approval processes. Analysis and assessment of project risks lie at the heart of these processes. The following sections will thus cover in more detail the approach which lenders tend to adopt to the specific petroleum industry risks.

15.4.1 Project Viability and Competitive Position

Before embarking on a detailed due diligence and financial structuring exercise for a project, lenders will want to assess the overall project viability. They will want to ensure that the basic project concept is feasible and that the sponsors' goals and objectives are reasonable and achievable. Much of the lender analysis at this stage will therefore be based on the overall perception of the industry and the market environment within which the project is competing. Making judgements on project viability is in itself a challenge. Lenders are asked to take long-term credit exposures that depend on the general performance of a volatile and risky industry. The competitive positioning of any particular project will be an important factor in determining long-term viability and lenders will thus seek to extend credit to the most competitive projects. As a result, project sponsors will need to demonstrate that their proposed projects are cost competitive even when markets are in a depressed state.

15.4.2 Pre-Completion Risks

We have already seen that almost without exception project development risks are high in the oil and gas industry. It is comparatively rare for a project to be completed without a degree of cost overrun or delay especially if the project is located offshore, uses unconventional technology or is subject to political risks and interference. Ensuring that the risks during the development phase of a project are acceptable to lenders is thus a challenging task.

Design and Technology Risk

Technology is essential to efficiently extract oil and gas resources and to transport, convert and deliver final products to consumers. Improvements and innovation in technology have created new industry growth opportunities, have resulted in reduced costs and enabled better products to be delivered to final consumers. There is, however, no guarantee that new or improved technologies will work as planned and there are many examples of innovative schemes which have either completely failed to work or have not achieved economic viability. There are thus significant risks associated with the deployment of new technology which project finance lenders are generally not prepared to accept.

In assessing technology risks lenders will want to ensure that the proposed technology is commercially proven and that there are no (or very limited) novel or innovative design features. There are no standard criteria for determining whether or not a particular technology is unproven or the design is innovative and lenders will rely to a significant extent on the opinion of their independent advisors. A number of factors will, however, influence the assessment of technology risks. The technology should have a demonstratable operating track record for plants of similar size operating in similar conditions. The results of pilot tests and studies will be important. Scale up and novel configurations of plant will be examined closely. Project sponsors should thus be prepared for extensive due diligence by the lenders and their advisors into the nature of the technology being used in projects. A strong argument will need to be put forward by project sponsors to re-assure lenders that the technology is proven. It may be that the risks are assessed to be too high in which case changes to the project design will typically be required.

Contractor Risks

We have already seen that development contractors play a vital role in managing and mitigating project completion risks. We have also seen that project sponsors can adopt a variety of contracting strategies during the pre-completion phase of projects. Lenders are, however, particularly aware of the risks of failure of the various contractors and will rigorously assess the suitability of the contracting arrangements and the experience, financial strength and reputation of the contractors. The lenders' preferred approach is to transfer as much risk as possible to the construction contractors through fixed price, date certain contracts. They will also require contractors to accept design and technology risks (including for instance the risks relating to technology licences), unforeseen site conditions and so on. Furthermore, lenders will expect the liabilities of the contractors, including liquidated damages, to be supported by financial guarantees including performance bonds, letters of credit and so on.

The lender requirements can, however, present challenges in the oil and gas industry. The size and complexity of many oil and gas projects usually means that the level of risk transfer and associated potential financial exposures are too large for any single contractor to accept. Furthermore, the transfer of risks to contractors can come at a significant cost that will increase the overall project budget. For certain activities in the oil and gas industry it is difficult to obtain fixed price terms. Drilling contractors, for instance, will not usually accept subsurface and geological risks and hence will normally only agree to daily hire rates or fees. In addition, it is common in oil and gas projects to enter into a variety of separate contracts with a range of specialist contractors. The disadvantage of this arrangement is that the lenders can no longer rely on single-point responsibility and appropriate mitigation of cost, performance and schedule risks is much more challenging. Lenders will therefore often require other forms of support, including sponsor completion support, contingent funding and so on.

There are a number of additional considerations that lenders will need to address relating to contractor performance and experience. Lenders will want assurance that the construction contracts address all the necessary environmental and social requirements together with relevant permits and authorisations. Controlling the activities of contractors can be challenging and lenders will want to ensure that they are able to monitor contractor compliance with relevant standards and authorisations. More generally, the degree to which a main contractor sub-contracts work can present significant challenges to the lenders. In many projects the main contractor may in fact sub-contract almost the entire work to third parties. Although the main contractor may be highly experienced and reputable, lenders have less control and visibility of sub-contractors. Poor performance of third party contractors has been known to have a seriously damaging impact on costs and schedule and lenders are acutely aware of the risks of sub-contractor performance. The risks associated with sub-contracting can become more challenging as a result of local content requirements imposed by governments on sponsors and contractors.[2] Significant tension can build up between the government, project sponsors and lenders over the level of local content and the ability of local firms to manage the risks associated with particular projects.

2. Licences, concessions and other types of agreement with national governments will often impose minimum local content requirements on project sponsors and contractors. The relevant parties will usually have to provide evidence that a minimum value of project work is performed by local contractors.

Project Interface Risks

The development of oil and gas projects usually involves the management of a wide range of interfaces. Upstream projects may rely on third-party pipelines, platforms and other infrastructure. Petrochemicals and refinery projects may be reliant on the dedicated supply of feedstock from undeveloped resources. LNG projects often share storage, port infrastructure and other common facilities. The performance of a project is therefore invariably dependent on other facilities outside the scope of the main project. The existence of interfaces between the project and other facilities often significantly increases pre-completion risks, especially the risks of delay caused by unavailability of dependent third-party projects.

Project finance lenders and their advisers will want to understand the nature of these interface risks and will spend a considerable amount of time examining the various technical and contractual relationships associated with project interfaces. Lenders will firstly want assurance that all the relevant interfaces have been identified and are part of a proper project interface management plan. They will then want to ensure that the project company is able to properly control and manage the relationships with third-parties so that the risks associated with the project interfaces can be minimised. Mitigating the risks associated with third-party projects and interfaces often creates significant challenges not least due to the limited direct control lenders have over third-party projects. Inevitably the best way of dealing with these risks is to minimise third-party interfaces as far as possible.

Project Completion

Project completion has significant implications for project finance lenders. At this point the project will begin to generate sustainable long-term cashflows and lenders will want to ensure that these cashflows are consistent with those presented in the original base case forecasts. We have already seen that, through reliability testing, projects will need to demonstrate that the performance levels assumed in the original base case are achievable. Successful completion of reliability tests will also typically allow the project company to begin paying dividends and trigger the release of any sponsor completion support arrangements. Lender control over the financing may also become weaker once project completion has been achieved including, for instance, controls over the ability of sponsors to transfer their ownership interests. The definition, testing and controls over project completion thus represent a vital element of lenders' assessment of pre-completion risks and are covered further in Section 12.3.3.

15.4.3 Post-Completion Risks

Reaching project completion is a major milestone for any project and typically a great source of relief for project lenders. Once the project enters the operational phase the risk profile changes and the financing typically becomes fully non-recourse.

Market and Revenue Risks

The volatility of oil and gas prices, and the fact that these prices vary depending a variety of complex factors including quality and location, presents considerable challenges to lenders. Indeed, in the current historically low oil price environment, price and revenue risks dominate almost all other considerations when lenders assess the acceptability of transactions in the industry. Prices and market movements are difficult to forecast especially over the long periods of time that are common in project finance. As a result, lenders take a conservative view on long-term prices in the industry and will expect the project sponsors to commit equity to provide an effective buffer against negative price movements. Lenders do accept, however, that in extending loans to oil and gas projects they will inevitably be taking exposure to oil and gas price and market risks. Notwithstanding, a considerable amount of time will need to be spent examining the impact of low prices on the underlying project economics. Although it is virtually impossible to fully transfer price risks to a third-party offtaker, a degree of price risk transfer may be achievable by negotiating floor prices or similar protection mechanisms into offtake contracts. In addition, the use of derivative contracts to manage commodity price risks may be a further option (see Section 18.5.3). In terms of volume risks, lenders will expect some level of risk transfer to credible third parties pursuant to long-term offtake agreements. The larger and more liquid the market, however, the less concern lenders have regarding volume risk transfer.

Supply Risk

In a similar way to market risks, lenders will examine in detail the volume and price risks associated with the supply of the raw materials for the project. Security of raw material supply, in terms of both quantity and price, is absolutely essential to the success of projects. Lenders will thus want to ensure that the project has an adequate supply of resources and raw materials for a period of time at least as long as the tenor of the loans.

For upstream projects supply risk concerns the nature, volume and production rate of the underground resources which are being developed. Reserves risk has already been covered in Section 6.3.1. For refining and petrochemicals projects, the success of the project is to a large extent determined by the arrangements for feedstock supply. Many refinery projects are able to process a variety of crudes which are available in the open market and it may be that the project can be financed without the need for committed supply. Particular refineries can, however, be much more constrained in their ability to process feedstock and may be designed to process a specific type of crude. Furthermore, petrochemical facilities usually require high specification feedstocks supplied from dedicated sources. In these circumstances, detailed due diligence will need to be undertaken to assess the security of supply and capability of the supplier.

A further consideration for refinery and petrochemicals projects is the price of supply. Widely traded raw materials will usually be supplied at market prices. Crude oil supply to refinery projects will, for instance, almost always be priced by reference to global benchmarks. Lenders could thus be exposed to the variability of both input and output prices. Given the high degree of price variability lenders will generally find it difficult to accept price risks without significant contingency in the project cashflows. The result is lower debt gearing ratios for refinery projects exposed to crude oil supply price risk. Feedstock supply to petrochemicals projects is, however, often based on fixed or deeply discounted prices reflecting the distressed nature of the materials. In this case, higher and more sustainable profit margins for petrochemicals products may be sufficient to support higher levels of debt compared to merchant refinery projects.

Operating Risks

Following project completion it is essential that operating rates and costs are achieved which are consistent with the base case assumptions. Lenders will scrutinise the operating assumptions underlying the project economics and will normally reject overly optimistic assumptions for project availability, especially in the early years if the project uses leading edge technology. The operating rate assumptions will therefore need to be confirmed by the lenders' technical advisor based on the performance of comparable projects utilising similar technology. Lender completion tests should also be designed to demonstrate the long-term operations of the project and consistency with the base case assumptions. The testing regime for project finance transactions is covered further in Section 12.3.3.

Lenders often require an element of operating risk to be transferred to a third party operator pursuant to some form of long-term commercial arrangement. Although less common in the oil and gas sector, project operation is sometimes contracted to a third party pursuant to a long-term operations and maintenance contract, especially for pipeline and infrastructure projects. More common in the upstream sector is the unincorporated joint operating agreement structure whereby one of the joint venture partners is appointed to operate the project. This structure can create some challenges for project finance transactions as control over the operations of the project can be significantly diluted, particularly if lenders are financing a minority share of the project. Some of the challenges relating to unincorporated joint ventures are covered further in Section 6.4.2.

15.4.4 Country Risk Mitigation

The methods lenders typically use to manage and mitigate country risk are explained in Section 13.2.3. We have seen, for instance, that lenders typically control their exposure to particular jurisdictions through a process of country ranking and the setting of country limits. The limits that lenders have in place for particular countries can severely impact the ability of project sponsors to access funding for projects. If country limit availability is restricted then sponsors need to consider alternative funding sources, including ECAs and multi-lateral organisations.

We have also seen that country risks can have a much wider impact on the viability of project finance transactions. Oil and gas projects are often nationally important and governments can often be involved in the corporate and commercial structures of project finance transactions. Even if they are not directly involved in a project, governments can still have a significant influence on project cashflows. As a result, project finance structures will often include features that are designed to reduce country risks to an acceptable level for lenders. Examples of such structural mitigants include:

- Host government agreements that recognise the interests of project finance lenders.
- Offshore bank accounts secured in favour of the lenders with direct payment by foreign buyers into these accounts.

Project finance structures in difficult jurisdictions will also tend to be more conservative generally with potentially reduced tenors, stricter covenants and events of default and higher levels of equity. Lenders will also naturally expect to earn higher fees and margins on their loans to compensate for the additional risks.

15.4.5 Environmental Risks

Environmental and social considerations are often the most demanding aspects of oil and gas projects that sponsors have to deal with. Bringing lenders into a project adds further layer complexity, including additional environmental requirements on top of those imposed by national regulators and the project sponsors themselves. Individual lending institutions often have their own environmental requirements. Government-owned organisations, particularly the multilateral agencies and ECAs, are especially sensitivity to environmental impacts. Public information disclosure requirements are onerous as are the requirement to fully engage with all relevant stakeholders. The multilateral agencies and ECAs will often have their own specific environmental compliance requirements and hence the involvement of a number of organisations in a project financing could involve sponsors dealing with a variety of complex and dissimilar procedures.

Given the dominant roles that the commercial banks have traditionally played in oil and gas project finance, it is important to understand the criteria that these institutions use to assess the environmental acceptability of particular project finance transactions. The majority of banks active in oil and gas project finance have adopted the Equator Principles.[3] These are a set of guidelines which were originally developed in an attempt to standardise the approach of commercial banks to the environmental aspects of project finance. The principles are based on the IFC Environmental, Health and Safety Guidelines[4] and cover the following broad areas:

- *Categorisation of projects*: The Equator Principles initially require projects to be categorised based on an assessment of the magnitude of potential environmental and social risks. There are three categories namely A, B or C with category A having the greatest risks.

3. The Equator Principles are intended to provide a minimum level of environmental and social risk management for projects. Around 80 institutions have adopted these principles in 35 countries. For more information, refer to www.equator-principles.com.
4. For more information, refer to www.ifc.org/ehsguidelines

- *Risk assessment*: The Equator Principles require an assessment of environmental and social risks to be carried out on relevant projects. This assessment is typically based on a full environmental and social risk assessment (ESIA) process.
- *Applicable standards*: An important element of the assessment process is to ensure that relevant environmental and social laws, regulations and guidelines are being complied with. In general the relevant standards are those of the host government. Given the diversity of standards adopted by different governments, however, the Equator Principles set a minimum standard requirement by reference to the IFC and World Bank guidelines. These are typically required when dealing with less developed environmental governance systems.
- *Management systems and action plans*: The Equator Principles require projects to develop satisfactory environmental management systems and action plans detailing the measures to be taken in order to reduce and manage environmental and social risks throughout the life of the project. The systems and plans will need to cover both construction and operation of the project.
- *Stakeholder engagement*: The Equator Principles require demonstration that there is ongoing engagement with various stakeholders. These stakeholders include local communities, indigenous populations and so on.
- *Grievance mechanism*: A satisfactory system for handling grievances from local communities will need to be established.
- *Independent review*: A review of the project is required by an independent consultant. In this regard, the scope of work of the lenders' environmental consultant will normally cover Equator Principle compliance.
- *Covenants*: Project finance documentation will need to include specific environmental and social related covenants that are broadly aimed at ensuring the project maintains compliance with the Equator Principles and all relevant laws and regulations.
- *Independent monitoring and review*: The Equator Principles require ongoing independent monitoring and review by an independent consultant.
- *Reporting and transparency*: The Equator Principles include various public disclosure requirements.

Although the integration of the Equator Principles into the project finance process is now well established, it is important for project sponsors to understand the requirements and potential impacts on any particular transaction. Lenders will require confirmation that a project if fully compliant with the Equator Principles and, if not addressed well in advance, this can create significant challenges during the negotiation of the financing.

For large project finance transactions in the petroleum industry the time and effort required to manage environmental and social issues should not be underestimated. Lenders to a project will examine the experience of the project sponsors in managing environmental risks. The sponsors should be able to demonstrate a strong track record preferably with previous experience in the relevant jurisdiction of the project. Lenders will also undertake detailed due diligence on the design of the project to ensure that environmental and social risks are minimised. Lenders will expect third-party consultants to provide satisfactory opinions on the environmental and social risk mitigation measures which are incorporated into the project design. In addition various monitoring and control provisions will normally be included in the financing documentation to ensure that the project remains compliant. The terms of finance will include specific environmental and social covenants, including the requirements to adhere to local laws and maintain relevant permits, information covenants on environmental and social compliance and reporting of incidents and so on. Ultimately breaches of environmental provisions could result in default and acceleration or loan prepayment.

15.5 RISK MITIGATION TECHNIQUES AND STRUCTURES

The previous sections have described the general approach that lenders take when assessing oil and gas project risk. The project lenders and their advisors will typically develop a detailed risk matrix which identifies the material project risks and shows how these risks are mitigated. Although the commercial and contractual structure of a project will determine how risks are transferred to third parties, it is not usually feasible to transfer all the project risks on to the various contract counterparties. We have seen already, for instance, that almost without exception commercial contracts include force majeure provisions that excuse the performance obligations of contract counterparties. At the conclusion of the lender due diligence process it should be possible to establish those risks that remain with the project and hence will impact the ability of the borrower to service its debt.

15.5.1 Dealing With Residual Risks Which Remain With the Project

Once the residual risks have been identified methods of dealing with these risks need to be developed. Lenders may view the risks as bankable and decide to accept them as part of their financial exposure. The first method of dealing with residual risks is therefore to attempt to convince project lenders to accept these risks. Although there is no certainty in lenders' attitude to bankability it is possible to make some general observations regarding lenders appetite for oil and gas project risks.

- *Commodity price risk*: Lenders have traditionally accepted that a degree of exposure to commodity price risk in oil and gas transactions is inevitable.
- *Sub-surface risks*: Lenders accept that upstream projects involve exposure to geological risks and that the estimation of reserves is subject to great uncertainty.
- *Feedstock supply risk*: If feedstocks are abundantly available then lenders have shown a remarkable degree of flexibility in accepting weak contractual arrangements with feedstock suppliers.

- *Technology risks*: Lenders do not usually accept new technology risk and will want to see a proven track record for the technology being used.
- *Completion risks*: The risks during the development phase of a project are difficult for lenders to accept and hence they will typically look for very strong single point responsibility pursuant to an EPC contract.

When deciding whether or not to accept project risks, lenders will typically want to understand the financial impacts of the particular risks. This is usually achieved by undertaking sensitivity analysis on the base case forecast cashflows to establish the impact of risk events on the ability of the project to service debt.

15.5.2 Risk Mitigation Through the Financing Structure

Acceptance of project risks by the lenders will often have important implications for the structuring of the project financing. The greater the level of risk retained by the project company, the more conservative the financing structure is likely to be. The features of the financing structure that will be most influenced by the project risk profile are: the level of debt or gearing ratio, tenor and repayment structure, the controls which lenders will impose on the construction and operation of the project and the additional financial support and overall security package. The structure of the financing is thus an important part of the risk mitigation process and it is in this area that bankers, lawyers and advisors can apply creativity to develop innovative structures. There is an almost unlimited number of factors that can be used to mitigate risk through the financing structure. Some of the more common techniques are discussed further.

- *Amount of debt*: The level of debt (and conversely the amount of sponsor equity funding) is probably the most important structural variable which impacts the bankability of a project. Although high risks do not in themselves prohibit lending, the levels of debt available for riskier projects will inevitably be lower. This point is often not fully understood when project sponsors assess the bankability of a project. Bankability, the level of residual risk and the amount of debt that lenders are prepared to accept are interrelated. Project finance structures may include mechanisms that directly determine the maximum amount of debt exposure. The borrowing base mechanism for upstream projects is an example of this (see Section 18.2.4). At regular intervals (usually every 6 months) the debt capacity of a borrower is determined using updated cashflows and minimum cover ratio requirements. If the redetermined debt capacity is lower than the existing debt outstanding then the borrower is obliged to make a mandatory prepayment of debt in order to reduce the debt levels to the redetermined maximum amount. In this way, the financing structure is directly linking the maximum amount of permissible debt to the price and subsurface risks.
- *Tenor of the loan*: Uncertainty in forecasting cashflows is reflected in the tenor of the financing. The more difficult it is to forecast variables, the less

willing lenders will be to provide longer tenor funding. Projects exposed to significant commodity price risk, for instance, are unlikely to be able to obtain debt tenors for much longer than 10 to 15 years. Political and country risks also impact loan tenors. It is more difficult to predict project performance in politically challenging environments or in countries with poor macroeconomic fundamentals. Loan tenors will therefore be shorter compared to those in more stable environments. Other factors impact loan tenors. Uncertainty in reservoir performance is usually reflected in lower proven reserves categorisation and shorter forecast production profiles. These forecasts will impact the project cashflows and hence loan tenors. In addition, the term of a key contract such as a tolling contract or pipeline throughput agreement will act as a constraint on the loan tenor.
- *Lender controls*: Project finance lenders influence the construction and operation of projects through various control mechanisms that are built into project finance structures. These control mechanisms are a form of risk mitigation as they direct the borrower to take certain actions or decisions or constrain the borrower in certain areas. In general, the higher the risk, the more control lenders will want to have over decision-making and borrower actions. Lender control rights will be examined in more detail in a later section.
- *Security packages*: The security package for a project financing will usually include features which are designed to mitigate project risks. Security structures can therefore be used to help manage the bankability of residual risks which reside with the project company. A borrower may, for instance, build up cash reserves for specific risks or obtain financial guarantees or letters of credit from third parties to cover particular risks.

Structural risk mitigation techniques usually involve additional cost. Lower debt levels increase funding costs, shorter debt tenors reduce cash available for dividend payments, excessive lender controls often result in inefficiencies and cash reserves or credit enhancement are expensive to maintain. Sponsors will therefore need to assess the costs and benefits of the various risk mitigation techniques and decide whether the overall risk transfer structure of a particular project financing is efficient.

15.5.3 Recourse to the Project Sponsors

After having exhausted all the various forms of risk mitigation described earlier, the lenders may still be confronted with risks that they are not willing to accept. To achieve a bankable transaction the only remaining option may involve the sponsors providing support in specific areas. Indeed, one of the most important skills in structuring a project finance transaction is to recognise that in certain circumstances sponsor support may be the only feasible option to mitigate specific project risks. Any support mechanism will, however, need to be carefully designed so as to ensure that the end result is efficient and acceptable to all. Too much support and the project will become unattractive to the sponsors, too little and it will be difficult for lenders to accept the risk profile of the project. Sponsors will usually want to assess the cost effectiveness of providing support to projects. A common method of doing this is to attempt to estimate the impact of the support on the cost of funds and compare this to the effective cost to the sponsors of providing the support. If several sponsors are involved in a project, each with different credit risk profiles, then the financially stronger sponsors will usually be extremely reluctant to provide support that effectively subsidises weaker partners. Larger and higher-rated entities will want to avoid as far as possible a situation whereby their balance sheets are effectively 'rented out' to fund risky projects. Finding a compromise position acceptable to all the sponsors, the various project lenders and potentially even contract counterparties can be difficult to achieve.

A variety of common support mechanisms are often found in project financing, including completion guarantees, contingent financing, parent guarantees of project counterparties and so on. Recourse to sponsors using more focused methods may also be required for specific project risks. The sponsors may, for example, provide feedstock or technology on a subsidised or preferential basis. When dealing with unincorporated upstream joint ventures, a minority partner seeking to raise finance for its share of project costs may be required by project lenders to guarantee the funding of unbudgeted cash calls. The negotiation of these specific forms of support can be particularly arduous. The sponsors providing the support will usually want to agree on some form of maximum monetary exposure or liability cap. Agreeing the amount of such a liability cap will inevitably involve extensive discussion and analysis of the underlying risks. An important task of the financial and legal advisors in these circumstances will be to seek common ground often by bringing to bear the structures and mechanisms used on comparable transactions.

Chapter 16

Project Economics and Cashflow Forecasting

Chapter Outline

16.1 INTRODUCTION

The last chapter looked at the approach lenders take towards risk analysis and risk mitigation in the petroleum industry. The focus was on the qualitative due diligence exercise that lenders undertake with the support of their various experts and advisers. The commercial and contractual arrangements that are designed to mitigate and allocate project risks ultimately need to be reflected in the project cashflow forecast. Thus, in addition to qualitative due diligence on project risks, a quantitative financial analysis of the project and an assessment of the impact of risks on project economics together form a vital and essential element of project finance structuring. The purpose of this chapter is to explain the nature of oil and gas project economic analysis focusing on the development and use of financial models, investment appraisal and lender credit analysis.

Section 16.2 looks at the central role of cashflow modelling in the project finance process and how this role varies over time. Project finance models are used to assess the economic performance of projects throughout all the phases of a project finance transaction. In the initial stages, financial models are used to determine project feasibility and approximate funding requirements. The models are then used to structure the financing and subsequently to monitor project performance. The development of cashflow forecasts is a complex and time-consuming exercise and hence is an activity requiring careful planning, resourcing and management. Some of the issues that need to be considered when developing cashflow models will therefore also be highlighted.

Section 16.3 examines how project cashflows for oil and gas projects are developed in practice. The importance of appropriate model assumptions is considered along with the issues that need to be addressed in each element of the model.

Section 16.4 will then examine how debt is incorporated into project finance models. The various loan facilities and structure of funding need to be reflected in the financial model so that various debt and equity performance measures can be calculated.

Section 16.5 looks at the optimisation of the financing structure and the determination of the lender base case financial model. Once the project free cashflows have been developed, the financing structure can be manipulated in order to develop the most appropriate financing structure in terms of capital structure, cost of funds and terms of financing.

Finally, Section 16.6 examines the use of the financial model and quantitative analysis in the decision-making process. The focus of this section will be on sensitivity analysis and other methods used to assess the impact of changes to the underlying financial model assumptions.

16.2 THE ROLE OF CASHFLOW FORECASTING AND MODELLING

Cashflow forecasting involves the estimation of monetary amounts over the life of a project. The forecasting exercise requires a considerable amount of financial information which is based on a wide range of technical, commercial and economic parameters. To cope with the extensive amount of detailed data that needs to be processed, project finance cashflow forecasting relies on sophisticated computer spreadsheet models. Project finance spreadsheet modelling has thus become an essential component of oil and gas project finance transaction management. It can even be claimed that without computer based spreadsheet modelling, project finance could not exist in its current form. The ability to manipulate financial information, test assumptions and scenarios and examine the impact of changes to debt service using computer models allows lenders to assess the security of their loans and examine the impact of changing circumstances on project economics.

Cashflow forecasting and project risk analysis do not exist in isolation. The lender due diligence process is an important source of information for the cashflow model. The sub-surface due diligence exercise for upstream projects is, for instance, the source of the production profiles that form the basic operational assumptions for the financial model. Likewise, for a refinery project, the lenders' market analysis on refined product margins will generate the assumptions for use in the refinery cashflow model. The financial model will also generate information which is relevant to the risk analysis process. Once risks have been identified the model can be used to assess the financial impact of these risks. The model is often a critical instrument in the negotiation of commercial and financial terms with contract counterparties and sponsors. The sponsors may, for instance, be expected to provide contingent financial support to the project during the operation phase. This support is invariably the subject of intense negotiation and the sponsors will usually expect their obligations to be capped at a particular level. The financial model is typically used to assess the appropriate level of support by manipulating the particular variable and assessing the impact on the cashflows.

The project finance cashflow model is not only used for credit analysis and commercial structuring, however. The model is also an essential tool for structuring the financing. The outputs from the model are used to assist in determining the optimum structure of the financing, particularly the debt amount and the debt repayment profile. The objective of the debt structuring is to develop the most efficient debt profile that matches the free cashflow profile of the project. We have already seen in Part II that the free cashflow characteristics of projects in the petroleum industry vary quite considerably throughout the value chain. It is therefore important to understand that the most efficient financing structure for a particular project will depend on the specific characteristics of the project's free cashflows.

16.2.1 Financial Modelling Throughout the Project Finance Process

The role of the financial model evolves over the life of a project finance transaction and it is essential that model functions as required from the initial feasibility stages all the way through to final debt repayment. As a project finance transaction progresses from basic feasibility through completion and on to debt repayment, the contribution made by the model to the financing process varies significantly. The financial model is typically used for a wide range of purposes including: initial feasibility assessment, determination of financing structure, sizing of facility amounts, reflection of developing documentation, supporting commercial and financial negotiations.The financial model is also used to provide important monetary amounts for various purposes (such as information memoranda, offering circulars and so on). Furthermore, project lenders require a financial model that is capable of performing sensitivity analysis for the purposes of credit approvals and for ongoing use during the documentation and monitoring stages. The model needs to be both accurate and adaptable in order to be a reliable decision-making tool.

- *Feasibility stage*: During the feasibility stage of the project the sponsors will consider various options on the basis of relatively limited and inaccurate information. The model will be used to assist the sponsors in making preliminary decisions on the scope of the project and the broad commercial structure. Flexibility and adaptability are critical requirements during this phase of the project finance process. The financing calculations will usually be basic and may only include rudimentary debt routines. Often the financial model at this stage will be aimed at assessing the viability of the project using sponsor equity returns and debt coverage ratios will typically be of secondary importance.
- *Financial structuring stage*: The model developed during the feasibility stage will usually require significant adaptation in order for it to be used for detailed financial structuring. The project level inputs will become more sophisticated and detailed and will need to reflect the ongoing commercial negotiations with third-party contractors. The model will also need to include detailed debt routines, including provisions for drawing of multiple debt tranches, repayments, interest calculations and lender cover ratios. During the financial structuring phase the model will, however, need to retain a significant degree of flexibility. Negotiations with the various potential lenders will need to be reflected in revised debt cashflows and the impact of negotiating positions on sponsor returns and cover ratios will need to be assessed. Throughout the structuring phase, the financial model becomes a key element in the decision-making process. It is also important to understand who will be using the model and what their requirements will be at each stage of the financing process. If, for instance, financial numbers generated by the model are to be used in specific commercial documentation then the format and calculation of these figures is often strictly defined and the model must adhere to these definitions.
- *Financial close*: Towards the end of the structuring phase the financial model takes on a greater level of definition reflecting the advanced stage of financial and commercial negotiations. The purpose and usage of the model also adapts to the needs of the project. At this stage the model results usually form critical inputs into the finance documents. The various repayment profiles detailed in the facility agreements will, for instance, be generated by the financial model. The model may also be used to fix hedging contracts and to calculate liability thresholds, liquidated damages and so on pursuant to various commercial and financial contracts. The inputs to the financial model will also need to be finally confirmed by the various lender consultants and a

third-party auditor will provide an opinion to the lenders on the acceptability of the model.[1]

- *Loan life*: The role of the financial model does not end at financial close. Indeed, the model is often an integral component of the financing structure. In the normal course of a project finance transaction the financial model will be used to calculate a variety of important parameters the most important being the debt coverage ratio used to determine significant payment obligations or support arrangements. The finance documents will usually include detailed and prescriptive provisions that establish responsibility for the custody and ongoing maintenance of the financial model, the methodology for updating model assumptions and mechanisms for resolving any disputes relating to the model and the forecasts.

A particularly important use of project forecasts is in the determination and redetermination of borrowing base amounts pursuant to borrowing base facilities. The exact mechanics underlying borrowing base financial models is discussed in more detail in Section 18.2.4. In terms of timing and use of these models, however, it is important to understand that the model outputs are used to initially size the maximum amount of borrowing. Once funds have been disbursed, the borrowing base is then recalculated at prescribed intervals and according to agreed mechanisms for updating the assumptions. The borrowing base financial model therefore takes on a greater level of importance during the life of the loan compared to more typical project finance models.

The financial model may also be needed in exceptional circumstances that are not necessarily provided for in the loan documentation. Updated models and forecasts will, for instance, be critically important if a project borrower runs into difficulties. The success of restructuring negotiations will often depend to a significant degree on revised financial forecasts capable of properly reflecting a borrower's existing financial position.

16.2.2 Managing the Financial Modelling Process

A project finance spreadsheet model is a highly complex set of interrelated data and calculations which together form an essential decision-making tool throughout all phases of the project finance process. The complexity and importance of the modelling function demands a structured and disciplined approach without which additional pressures will be created throughout the project finance process. Given that the financial forecasts are often used to make multi-billion dollar decisions, modelling errors can be extremely expensive. It

1. Model auditors usually provide a relatively standard audit confirmation letter for project finance transactions. The scope of work covered by the auditor will typically include: review of the model logic, coding and macros, consistency of inputs and assumptions with contracts and financial documents, compliance with relevant tax and accounting standards (including IFRS compliance) and the ability to perform sensitivity analysis.

is thus essential to ensure that the responsibilities and resourcing of the modelling process are properly managed.

The financial advisor is usually responsible for developing and managing the financial model. The experience of team members in building and controlling models (rather than analysing existing models) should be carefully scrutinised as part of the advisory selection process. Furthermore, the nature of the financial modelling work is such that responsibility usually falls on to an individual transaction modeller within the advisory team. This individual invariably becomes a critical component of the project finance process and sponsors should thus be aware of the dependence of the process on the ability of the modeller to effectively deliver the required modelling outputs. The financial advisor is also normally responsible for managing the audit of the model by an independent third party model auditor.

The management of information is especially important in the modelling process. Financial models require detailed assumptions from a variety of sources and responsibility for delivering these assumptions should be clarified. The financial modeller is rarely close enough to detailed project information to be able to generate the assumptions which underpin the cashflow forecasts. Basic physical data, including production assumptions, product yields, utility consumption and so on will need to come from relevant areas of the project team. Furthermore this data will have to be provided in the correct format, time periods, currency and monetary basis. Data on project costs, especially operating cost line items and capital costs, are vitally important and often the most difficult to estimate. Individuals within the project management team will need to be clearly responsible for the collection and provision of this data. Without proper information management and planning serious delays and incorrect decision-making will usually be the result. All the model inputs and outputs will eventually be documented in an assumptions book and the project finance information memorandum.

The project financial model may also use outputs from other types of models, including those used for technical and economic purposes. A financial model for a refinery project financing may, for instance, use outputs from a refinery linear programming model. A petrochemicals project financing will usually use product prices generated from a complex pricing model which is based on raw material price assumptions and operating margins. Oil and gas field production data is usually derived from sub-surface reservoir models. The interface between the various different models can be difficult to manage and clear responsibilities need to be clarified at the earliest stages of model development.

16.2.3 Cashflow Waterfall

The cashflow waterfall is a presentation of cash inflows and outflows according to the seniority or priority of the payments that are forecast to be made to the various parties to the project. Project revenues are shown at the top of the waterfall and are firstly used to pay operating costs. These costs include payments for feedstock and other supplies, labour, insurance, rent and so on. Unless these payments are made then the project will not be able to continue operating and, as a result, any project revenues must be used to pay operating costs in priority. Secondly, essential capital costs and taxes[2] will be paid out of remaining funds. Ongoing capital costs need to be paid for a variety of reasons, including plant maintenance, well workovers, ongoing development drilling and so on. It is often difficult to determine whether ongoing capital costs are essential to maintain the projected revenues or are discretionary. Given that these costs are paid in priority to debt service, lenders will usually want to ensure that payments are carefully controlled. The cashflows remaining once any debt and equity has been used to fund project costs, is shown as cashflow available for debt service which is then applied to pay interest, scheduled debt principal and, finally, dividends. A simplified waterfall is illustrated in Table 16.1.

This hypothetical waterfall assumes a two year construction period followed by the first two years of project operations. In the pre-completion period cash is required to fund project capital costs. In this case US$ 100 million is assumed to be required spread equally over the two year development period. These cash outflows are funded using debt and equity on a 70:30 pro-rata basis. The cash

TABLE 16.1 Simplified Cashflow Waterfall

US$ '000s	Year 1	Year 2	Year 3	Year 4
Revenues			80,000	80,000
Operating costs			30,000	30,000
Operating cashflows			*50,000*	*50,000*
Capital expenditure	50,000	50,000	2,000	2,000
Tax			8,000	8,000
Cashflow before funding	*50,000*	*50,000*	*40,000*	*40,000*
Debt drawings	35,000	35,000		
Equity funding	15,000	15,000		
CFADS			*40,000*	*40,000*
Interest			5,000	4,500
Principal			15,000	15,500
Total debt service			20,000	20,000
Dividends			20,000	20,000
ADSCR			*2.0*	*2.0*

2. In reality most jurisdictions require taxes to be paid in priority to all other payments and the consequences for non-payment are severe. It is customary, however, to present tax below operating costs in the cashflow waterfall.

waterfall during this period is often required on a more frequent basis (typically monthly or quarterly) to enable more accurate budgeting of funding requirements and to calculate more precisely the interest costs during the construction period. Once the project achieves completion, operating cashflows begin to be generated which are used to service debt and pay dividends. In this case the project generates US$ 40 million of free cashflow in years 1 and 2 and has a debt service requirement of US$ 20 million. The annual debt service cover ratio in this instance is, therefore, 2:1.

In practice, cash waterfalls are normally significantly more complex and detailed compared to the aforementioned simplified illustration. Waterfalls will also need to reflect funding and withdrawals from the various reserve accounts, prepayments, cash sweeps, deferrals and so on. Ultimately the waterfall in the financial model should be consistent with the various payment priorities and account movements as detailed and agreed in the loan documentation. Given that the cash waterfall is used to calculate vitally important outputs which feed into ratio and return calculations, it is essential that this component of the financial model is accurate and conforms to the underlying financial structure.

16.3 BUILDING THE PROJECT FORECASTS

The project free cashflows represent the net balance in a particular period of cash receipts and cash payments prior to the servicing of debt and payment of dividends. Forecasting free cashflows for the life of the project therefore requires estimates of all cash receipts and payments for each period.[3] These estimates are built-up from a wide range of assumptions relating both to general and project specific variables.

16.3.1 General Assumptions

There are a number of general forecasting assumptions that need to be considered before the detailed modelling work begins.

- *Model currency*: All international projects involve payments and receipts in more than one currency and it is thus necessary to decide at an early stage on the base currency of a financial model. The working currency for the international petroleum industry is the US dollar and, as a result, the dollar is the most common currency for project models in this industry. In addition, most projects raise dollar funding and hence it is important to assess dollar cashflows for debt service. Some important cashflows may, however, be denominated in non-dollar currencies, especially local taxes and local operating costs. Local taxes are calculated by the relevant tax authorities on

3. In reality it is not feasible to forecast all the project cashflows and some level of materiality will need to be adopted. Time spent on small expense items (office stationery, for instance) is hardly likely to be worthwhile when dealing with free cashflows in hundreds of millions of dollars or more.

a local currency basis hence to ensure accuracy the forecasts financial statements should be generated in the same currency as that used in the local tax computation. In practice most project finance models simplify the calculations and calculate local taxes in dollar on dollar based financial statements. In the majority of cases this simplification should not create significant issues although the requirement to generate local currency financial statements for tax calculations purposes should not be overlooked.

- *Exchange rate forecasts*: The methodology for forecasting of exchange rates is closely related to the issue of the base model currency. Any multi-currency model will require exchange assumptions for the period over which the forecast is made. Although actual exchange rates may be forecast for each period and input directly into the model, it is more common to base future exchange rate movements on forecast differentials in the relevant national inflation rates. This method is known as 'purchasing power parity' and, although supported by economic theory, in practice the forecast rates can be far from reality. Particular care is needed when modelling in countries with high rates of local inflation. Cashflows can be seriously distorted and the impact on tax and accounting also will need to be carefully assessed to ensure that inflationary impacts are properly treated in the model.
- *Model timing*: The timing assumptions underpinning the forecasts are extremely important. Models are typically developed on the basis of six-monthly cashflow aggregation that matches the usual period for payment of principal and interest under the debt facilities. For certain calculations, however, different time periods may be required. During the construction period, for instance, monthly periods are often used. In addition, the annual summary financial statements will normally be required.
- *Monetary basis*: Models may be based on "money-of-the-day" or "real" monetary values. Money-of-the-day is the term used when cashflows are presented on the basis of nominal actual monetary forecast cashflows in each period of the model. If the model assumptions are prepared on the basis of the then current monetary values then inflation factors will have to be applied to ensure that the assumptions are consistent with the later time periods. Real values are based on monetary amounts using the then current period as the base period. The use of real values can create significant issues in project finance. Most importantly, debt service is expressed in terms of nominal amount in future periods. Without adjustment, therefore, the use of real values for the project level free cashflows combined with nominal cashflows for scheduled debt service payments will result in an incorrect forecast of debt cover ratios. Debt service in each period will thus need to be deflated in order to ensure that both the denominator and nominator of the calculation use the same monetary basis. Although many organisations make use of real values for modelling purposes, almost without exception money-of-the-day values are used in project finance general practice. This does, however, involve forecasting inflation rates, the risks of which have been examined already in Section 13.2.2.

It is important to consider these general model assumptions carefully early in the forecasting process. Given that these assumptions form the fabric of the spreadsheet modelling calculations, making changes becomes increasingly difficult as the modelling process progresses.

16.3.2 Construction Period Assumptions

During the construction period costs are incurred in the development of the project and these costs are financed by debt drawdowns or equity injections. For the majority of the development period the project is not generating operating cash inflows.[4] Towards the end of this period the project will begin operations and should start to generate positive cash inflows from operating activities.

Construction Cost Assumptions

The construction cost assumptions in the financial model are derived from the construction phase budget and typically include the following cost categories: capital costs pursuant to EPC contracts, costs pursuant to other contracts (including drilling contracts, service contracts, legal, finance and consultancy fees, interest during construction), owners costs, pre-development expenditure and insurance. Lenders typically expect accurate (+/−10%) budget estimates to form the basis of the construction cost assumptions and hence a significant degree of project scope and definition is needed for the final forecasts. Furthermore, lenders will also want to ensure that there is a sufficient level of contingency in the project budget to ensure that foreseeable cost overruns can be funded. To ensure that the cost estimates are reasonable, the lenders' independent technical consultant will be expected to confirm the capital cost assumptions and provide an opinion on potential cost overrun scenarios.

Funding During Construction

The cash outflows during the construction period are funded from equity and available loan facilities. Given the range of funds that are usually available to fund costs during the construction period, the modelling of construction period funding can become complex. There are usually a number of important constraints that the model needs to adhere to. In particular, certain loan facilities may only be available to fund specific project costs. Export credit agency funding, for example, is usually tied to the eligible content of export contracts and hence the financial model should include mechanisms to ensure that export credit financing is properly matched to the eligible costs. In addition, the financial model will need to ensure that loans are only drawn under particular facilities up to the total amount of that particular loan.

4. During the development period of upstream projects, revenues may be generated in advance of full project completion. Early oil production is, for instance, often a core objective of the project sponsors, the goal being to generate revenues prior to full field development. The base case financial model for upstream projects may thus need to include assumptions and routines to reflect early production.

Revenues During Construction and Build-Up During Initial Operations

Projects do not usually start production immediately. Process plant, for instance, will start production during the initial commissioning period and continue to build-up production during testing and the first several months of operations. Upstream projects usually involve some form of production build-up and this may involve ongoing production well drilling and completion, potentially throughout the life of the project. The modelling of cashflows during initial operations and build-up periods needs to be carefully considered, especially given that the net cashflows associated with initial production are typically assumed to be available to fund project costs. As a result, lenders will scrutinise these cashflow assumptions and will want assurance that they will in fact materialise. Depending on the perceived risks associated with any revenues projected to be earned during the construction period, the lenders may require contingent funding commitments from the sponsors, usually in the form of cost overrun equity subscription or sub-ordinated loans.

16.3.3 Operating Period Assumptions

Once the project is complete the financial model will need to be able to calculate operating revenues, operating costs, ongoing capital costs, tax payments, financing cash flows and dividends. In addition, the financial model will need to reflect the underlying financing structure, including, for instance, the cash movements on various bank accounts and the restrictions on payments to shareholders and sponsors.

Revenues

Forecasting the revenues for a project involves predicting the productive capacity of the system, assessing the market demand and forecasting the price for the product sold. For project finance cashflow forecasting, project lenders will want to ensure that the assumptions regarding production and product prices are conservative. If the project is structured on the basis of a toll or throughput agreement then the revenue calculations will often be more straightforward and will reflect the terms of the underlying contract.

Firstly, regarding production volumes, assumptions concerning the production capacity of the project over the forecasting period of time will need to be agreed. These assumptions will need to take into account the requirement for production ramp-up and outages (forced and unforced). Lenders will examine these assumptions in detail with their technical adviser to ensure that they are reasonable. The production profiles for upstream oil and gas are typically based on proven reserves and confirmed by the lenders' reserves consultant.[5]

5. The reserves consultant will usually be expected to certify the reserves and it will be these certified reserves which form the inputs to the financial model.

Secondly, in order to derive total project revenues, product prices will need to be assumed for the model period and applied to the forecast sales volumes. For oil and gas projects a variety of different price forecasts will usually need to be assumed, including those for crude oil and natural gas prices, refined product prices, refinery margins, tariffs, freight rates, rig rates, petrochemicals prices and so on. For any particular project lenders, will want to ensure that the price forecasts are reasonable and they will typically take a conservative view in the context of historical price movements. The price assumptions in the financial model may be derived directly from the lenders' market consultant.

Once gross revenues have been calculated based on price and revenue assumptions, a number of deductions may have to be made to arrive at the net overall project revenue in any particular period. The most common deductions relate to marketing and distribution costs, including freight for shipping product to market, marketing fees payable to offtakers, import and export duties and so on. These costs can be significant and are often difficult to accurately forecast over extended periods of time. Care is thus needed to ensure that the cashflow forecasts include all relevant costs in marketing and distributing product to the final consumers. Other deductions to revenues may include profit share and royalty components of production sharing agreements and so on.

Operating Costs and Ongoing Capital Costs

Operating cost assumptions include the raw material and supply costs, labour costs, overheads, insurance, maintenance, licence fees and so on. Many of these costs, particularly raw material and supply costs, will be generated pursuant to contracts with third parties. The financial model should thus incorporate the payment terms agreed in any relevant contractual arrangements. In certain circumstances, the currency of particular costs may be different to the underlying currency of the model. In such cases it is imperative that the financial model includes provision for currency conversion and an assumed long-term exchange rate. Crude oil is, for instance, usually a dollar cost to a domestic refiner in contrast to the other costs and revenues which are often denominated in local currency. Refinery forecasts should be able to handle the conversion of dollar crude costs into local currency. In addition, lenders will expect operating cost assumptions to be confirmed by the technical consultant.

Ongoing capital expenditure relates to capital costs which are required to achieve the ongoing production and revenues assumptions. It is essential to ensure that the revenue assumptions included in the financial model are consistent with the capital cost assumptions. As an example, the forecast production assumptions relating to an upstream project will usually require ongoing drilling and facilities expenditure throughout the life of the project. The cost assumptions relating to these ongoing field development and reservoir management activities must reflect the level of ongoing work required to achieve the forecast production volumes.

Tax, Fiscal Arrangements and Accounting

The impact of tax and other fiscal arrangements on the economics of oil and gas projects has been examined in Section 11.4. We have seen that governments want to ensure that oil and gas projects contribute an appropriate share of income to national economies. The tax and fiscal regimes are often complicated and impact projects both at a general level through national tax systems and at a specific level through fiscal arrangements specific to the sector and the project. The financial model thus needs to incorporate forecasts of tax and other payments to national and local governments. Given that these payments are often sizeable and are paid in priority to debt service, lenders will want assurance that these forecasts are reasonable. Typical calculations which need to be included in the financial model include depreciation and capital allowances, allowable and disallowable deductions, treatment of tax losses, including carry forward and carry back provisions and tax rates and timing of tax payments. In addition, the tax assumptions may need to address other specific issues which are unique to the petroleum industry.

Although project finance is a cashflow-based form of finance, the accounting treatment of particular transactions can be important and will thus need to be addressed in the forecasts. Projected financial statements will need to be included in the model outputs and the project sponsors will normally want to assess the impact of their investment on corporate level accounting measures. Assumptions regarding the rates and methods of depreciation will need to be incorporated into the financial model. Given the fact that various categories of capital expenditure will usually need to be handled over different periods of time, the various depreciation routines can become complex and involved. Multiple foreign exchange rates, inflation and timing differences can also impact the forecast financial statements and can add a significant level of further complexity into the model coding.

16.4 DEBT ROUTINES AND MODEL OUTPUTS

Once the project level free cashflows have been generated, the debt cashflows can then be modelled. As previously noted, the objective of debt modelling is to develop the most efficient debt cashflow profile by tailoring or 'sculpting' these debt related payments to the projected cashflows of the project. Having incorporated the debt cashflows into the financial model, the key outputs from the model can then be calculated. These include the various debt cover ratio measures and sponsor returns.

16.4.1 Modelling Debt Cashflows and Loan Routines

The aim of debt modelling is to forecast the cashflows associated with the debt obligations of the project company. Given that these cashflows will be used to calculate the cover ratios which in turn will be used to determine acceptable debt levels, it is important that the assumptions are forecast as accurately as possible. During the construction period of a project, the modelling of debt drawdowns is driven by the construction period capital expenditure profile. During the operating period the principal debt repayment cashflows are typically fixed according to the terms of loan agreements and, at least in theory, forecasting these cashflows should be less demanding compared to other more variable project level cashflows. There are, however, a number of complicating factors which require careful consideration.

- *Multiple loan facilities*: Most project finance transactions involve a variety of different loan facilities, all of which need to be modelled. There is typically a degree of optionality in the usage of debt facilities and hence assumptions need to be made regarding the priority of the various facilities. The financial model therefore will need to incorporate assumptions for each of the loan facilities that could be used to finance the project. During the early stages of the project finance process flexibility is typically built into the cashflows to allow different facility options to be selected and modelled as required.
- *Repayment flexibility*: For individual loan facilities there is often a degree of repayment flexibility that needs to be accommodated in the financial model. Repayment schedules can be designed to allow for prepayments through cash sweeps, deferrals and so on. The detailed mechanics of these repayment structures can be complex and will need to be reflected in the debt cashflow modelling routines.
- *Seniority and priority of debt*: The seniority of the various loans should be honoured in the model. Debt routines will need to incorporate mechanisms not only for senior loans but also shareholder senior facilities and subordinated loan facilities. Equity bridge loan drawdowns and repayments will, in addition, need to be structured into the model.

In addition to loan drawdowns and repayments, the cashflows relating to interest and fee payments will also need to be forecast. Assumptions are therefore required for LIBOR rates (which are usually based on the relevant LIBOR forward curve) and loan margins together with upfront, commitment and agency fee assumptions.

In Section 16.2.3, the concept of the cashflow waterfall was explained. A fully developed cashflow waterfall is an essential part of the debt modelling routines and will need to incorporate detailed calculations for each of the potential debt facilities. The waterfall will determine the timing and amount of debt drawdowns and repayments which will then be used to calculate the debt outstanding under each facility and the interest payable on each interest payment date. Table 16.2 shows an example of a typical debt modelling routine using the cashflows from the waterfall presented in Table 16.1.

This simplified example uses the loan totals from the cashflow waterfall and assumes that the actual debt funding is comprised of two separate facilities namely

TABLE 16.2 Illustrative Debt Modelling Routine

US$ '000s	Year 1	Year 2	Year 3	Year 4
1. *ECA tranche*				
Opening balance		25,000	27,000	22,500
Drawings	24,000			
Interest capitalised	1,000	2,000		
Repayments			4,500	4,650
Closing balance	*25,000*	*27,000*	*22,500*	*17,850*
Interest paid			1,500	1,350
2. *Commercial tranche*				
Opening balance		10,000	43,000	32,500
Drawings	9,500	31,000		
Interest capitalised	500	2,000		
Repayments			10,500	10,850
Closing balance	*10,000*	*43,000*	*32,500*	*21,650*
Interest paid			3,500	3,150
3. *Loan totals*				
Opening balance		35,000	70,000	55,000
Drawings	33,500	31,000		
Interest capitalised	1,500	4,000		
Repayments			15,000	15,500
Closing balance	*35,000*	*70,000*	*55,000*	*39,500*
Interest paid			5,000	4,500

an ECA facility and a commercial bank facility.[6] The loan routines can then be build-up based on a number of fundamental assumptions which will include:

- *Drawing priority*: The loan routines will need to accurately handle any drawing constraints agreed as part of the financing structure. ECA facilities are, for instance, assumed to be drawn for specific eligible costs.
- *Calculation of interest*: Interest is calculated based on an assumed LIBOR rate for each period and the margin applicable to each facility. An assumption will also have to be made regarding the timing of drawings given that loan drawings made at the beginning of the period will accrue a full period's interest while those at the end will accrue no interest.

6. Note that for the purposes of this example the figures presented in the table are illustrative only and are not based on any particular set of specific assumptions.

- *Capitalised interest*: Interest is normally added to the loan balance during the construction phase rather than being paid.
- *Repayment profile*: The loan routines will need to reflect the agreed and documented repayment schedules for each separate facility during the operating period. In this case an annuity profile is assumed.
- *Interest and fees payable*: The calculation of interest payable during the operating period will be based on the applicable LIBOR rate and the relevant balance outstanding for the period. Fees calculations will also need to be included in the routines.

When dealing with multiple currencies changes in exchange rates will also need to be incorporated into the loan routines. If the cashflows are presented in pounds sterling whereas the loan is denominated in dollars then an additional calculation will need to be incorporated to determine the closing balance in sterling assuming an appropriate closing balance exchange rate. This can be accommodated with an additional line called 'exchange rate adjustment to closing balance'.

16.4.2 Lender Cover Ratios

Once the various loan routines have been incorporated into the financial model, the lender cover ratios can be calculated based on the free cashflows available to service debt and the debt service requirements in each relevant forecast period. We have already seen that lender cover ratios perform an essential role in the analysis and structuring of project finance transactions. Cover ratios are needed to test the debt capacity of a project and are usually calculated in a number of different circumstances during the life of the project finance loan. Most importantly, the lenders will expect the financial model delivered prior to first drawdown to demonstrate agreed minimum cover ratios. The cashflows forecasts generated by this model will serve as the basis for the lenders credit approvals and commitments to lend. Upstream projects that have been financed on the basis of a borrowing base facility will use the loan life cover and project life cover ratios to determine the available borrowing base amount at the beginning of the loan period. These ratios will then continue to be used at each redetermination date throughout the life of the loan.

Cover ratios are also used on an ongoing basis once the project loans have been fully drawn. Common uses for the ratios include:

- *Dividend distributions*: The borrower is typically only allowed to pay dividends and service any subordinated debt if the project cashflows are able to demonstrate minimum debt service coverage ratios.
- *Borrower default*: A breach of cover ratio test is usually included as an event of default. Unless the borrower is able to demonstrate compliance with minimum cover ratios then an event of default will occur allowing the lenders full remedies, including acceleration and enforcement of security.

- *Further debt*: Project borrowers will often want some flexibility to incur additional senior debt, in particular to fund permitted expansion projects. In order to increase debt levels the borrower will usually need to demonstrate that the forecast cashflows can maintain minimum levels of debt cover assuming that the new debt is incorporated into the financial structure.
- *Completion testing*: Cover ratio tests usually form an important element of the lenders' reliability testing regime. In particular, if the project company is unable to achieve the minimum levels of production then, in certain circumstances, the completion tests can deemed successful provided the borrower prepays a proportion of the outstanding debt. The amount of debt to be prepaid is determined by calculating the maximum outstanding loan balance which results in the restoration of the agreed minimum cover ratios.

Although the basic concept of debt service cover is not difficult to understand, in practice the calculations of the ratios can be complex and the subject of lengthy negotiation between the project sponsors and lenders. Various issues will need to be addressed and agreed between the parties, including the time periods over which cover ratios are calculated, inclusion and exclusion of items from the denominator and numerator and the procedures for calculating the ratios all need to be carefully defined and agreed.

Cover ratios are usually calculated using annual cashflows and on a rolling semi-annual basis using either historical or projected cashflows. If the ratios are calculated using projected cashflows then the model assumptions will need to be updated at each calculation date. In general, the cashflows available for debt service should include all cash receipts and payments that rank in priority to debt service during the relevant period. The treatment of certain receipts and payments can be the subject of lengthy negotiation. Payments to or from counterparties to various derivative contracts can, for instance, be treated in a variety of different ways.[7] The treatment of cash balances and payments to and from reserve account can also be handled in different ways depending on the particular characteristics of the underlying cashflows.

16.4.3 Project Investment Appraisal and Investor Return Calculations

The various lender debt cover ratios described in the previous section are designed primarily to assess the capacity of a project to support senior project finance loans. The sponsors and investors will, however, also need to determine whether the project represents a financially viable investment opportunity.

7. In general, the cashflows associated with derivatives contracts should be netted against the relevant underlying transaction cashflows. Payments to or from an interest rate swap provider should, for instance, be netted against the interest component of debt service in the denominator of the DSCR calculation. Payments relating to commodity hedge contracts should be netted against the relevant cashflows in the numerator.

The cashflow model developed for a project financing thus needs to calculate the required investment appraisal measures. The different investment appraisal techniques that are commonly used to make investment decisions, have previously been covered in Section 2.3.2.

Selecting the correct cashflows to be used in the calculation of investors' returns needs some consideration. There are a number of economic theories and concepts that tackle various issues concerning investment appraisal and capital structure. Although it is not the intention of this text to cover this subject in detail, it is necessary to understand in broad terms the practical implications for financial modelling. It has been argued, for instance, that investment decisions can be separated from financing decisions[8] and that capital structure is irrelevant to project returns on investment.[9] In practice this means that when calculating NPVs or IRRs a decision has to be made as to which cashflows to discount. If investment decisions are separated from financing decisions then the project level free (or 'unlevered') cashflows should be discounted. The cashflows relating to equity investment and dividend flows are calculated after deducting interest, principal repayment and other financing cashflows. As a result, the equity level (or 'levered') cashflows are not relevant for investment decision making. Although this approach is supported by economic theory, in practice project level cashflows are also influenced by the financing structure, particularly when considering the tax deductibility of interest and the potential insolvency costs associated with very high levels of debt. In addition, the investment returns and net present values based on the cashflows after servicing debt are often important to project sponsors. As a result, financial modelling practice tends to focus on the levered cashflows to equity rather than the project level cashflows. If cashflows to equity are used to measure sponsors' investment returns then it is important to ensure that any hurdle rates used to determine the acceptability of returns are consistent with the assumed level of debt used to calculate the levered cashflows.

A further complication can arise when dealing with the different returns accruing to the various sponsors of a joint venture. The cashflows relevant to each sponsor may not be the same as the project level cashflows. Each sponsor will fund its proportionate share of equity investment and receive its proportionate share of dividends. Various factors can seriously distort these cashflows, including carried interests, production sharing, differing tax treatment, equity in-kind and so on. Furthermore, other non-dividend sources of income may be relevant to a particular sponsor's investment decision. Additional income may be earned, for instance, from licence fees, operating fees, marketing fees and so on. The project sponsors will need to agree how these differing sponsor level cashflows should be incorporated into the financial model. The differences in

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8. As proposed by the US Economist, Irving Fischer (The Fischer Separation Theory).

9. As proposed by the Nobel prize winners, Franco Modigliani and Merton Miller (The Modigliani–Miller Theory).

returns to the various joint venture partners can be highly sensitive and hence the approach to the modelling of the various return calculations need to be carefully handled.

16.5 DEBT OPTIMISATION AND THE BASE CASE

Having developed the forecast project cashflows, including all the various agreed assumptions, and incorporated the required debt routines with coverage ratio and investor return calculations it is possible to start to work towards the development of the best financing structure for the project.

The process of debt optimisation begins with the project level free cashflows and, through the manipulation of a number of core variables, aims to match the debt cashflows with the project cashflows in the most efficient manner. The aim of this debt optimisation process is to maximise the amount of debt within the constraints of the project cashflows. The three major variables that have the most significant influence on debt service in any given period are the amount of debt, the repayment profile and the tenor of the debt.

- *Debt level*: It goes without saying that a higher debt amount results in a higher debt service requirement. By adjusting the debt-to-equity ratio, therefore, the coverage ratios can be manipulated. By the same logic, a higher debt coverage ratio requirement means a lower cashflow debt capacity. It can be readily seen, therefore, that less debt can be raised against more volatile cashflows which require higher coverage ratios.
- *Repayment profile*: The repayment profile will also influence the debt service level in a given period. Debt repayments are determined contractually between a borrower and a lender and can, in theory be structured in any way agreed.
- *Debt tenor*: The debt tenor is a strong determinant of absolute level of debt service. The longer the debt tenor, the more periods over which the debt service can be repaid and hence the lower the debt service requirement in any given period. With a given cashflow profile and specified minimum coverage ratios, therefore, the financial structure can be optimised by manipulating the amount of debt, the proportion of debt repaid in any period and the tenor of the facility.

By carefully adjusting the debt level, repayment profile and debt tenor, it should be possible to move towards the most appropriate funding structure within the constraints of the project free cashflows. Then, once the financing structure has been optimised, the facility sizes and debt cashflows can be fixed. The resulting cash flow forecasts and underlying assumptions should then be fully agreed. The model is then termed the ‘Base Case’ and represents the agreed view on the economic forecast of the project. The Base Case is then used to examine the sensitivity of the project to various more conservative assumptions. These will be examined in the following section.

16.6 SENSITIVITY ANALYSIS AND DEBT BREAK-EVEN

The financial model is an essential component of the project finance decision-making process. The model outputs are often the key determinant of the negotiations throughout the structuring of a project finance transaction. In order to make decisions, however, the various parties to the transaction will typically want to understand the financial impact of changes to the various model assumptions. In addition to the development of a base case financial forecast, therefore, a key task in the quantitative analysis of projects is to examine the impact on model outputs of altering the model assumptions. This is known as sensitivity analysis and, as well as identifying the monetary impacts of uncertainty, it will also help to understand the relationships between various elements of the project financing.

The ability to vary assumptions in the financial model also allows lenders to identify the minimum or break-even point below which project cashflows are insufficient to service debt. This exercise is known as break-even analysis and is especially important when considering highly uncertain or volatile assumptions including, for instance, break-even commodity prices.

16.6.1 Sensitivity Analysis

The sensitivity of project cashflows is tested by individually varying input assumptions and analysing the effect on model outputs. A number of decisions need to be made prior to performing sensitivity analysis. Firstly, the assumptions to be varied will obviously need to be chosen. Given that the majority of the assumptions are derived from, or confirmed by, the due diligence work carried out by independent consultants, these consultants will usually have an important role to play in selecting the assumptions to be tested. An important part of the technical due diligence on a petrochemical plant, for instance, may be to assess the financial impact of a particular process unit failing to achieve completion. Secondly, the level of variation of the selected assumptions will need to be established. Realistic down-side sensitivities should be used in the analysis. There is little point in varying a particular assumption to extent that, in practice, is unlikely to be credible. Whilst it may be reasonable to assume oil prices drop to US$ 10 per barrel for a short period of time, this is unlikely to be a useful level of variation over extended time periods, not least because most projects would fail at this level. A better approach would be to establish the oil price debt break-even point for a particular project and test this against current oil price projections.

The most important assumptions that are usually tested for oil and gas projects include: capital costs, operating costs, production volumes, product prices, inflation and interest rates, completion schedule and foreign exchange rates. Lenders may also want to see the sensitivity of the project to sources of income generated pursuant to particular project contracts. If, for instance, project cashflows can continue to service debt even with the exclusion of an offtake contract with a weak counterparty then the lenders should be less concerned about the credit-worthiness of that particular counterparty. Other more sophisticated sensitivities may be run to test the commercial viability of a particular project. If a refinery project is structured on the basis of a tolling agreement, for instance, the lenders may want to see the underlying economics of the refinery, excluding the toll.

Sensitivity analysis is used at all stages of the project financing process. During the structuring phase assumptions can be varied to determine whether the level of debt in the project is sustainable. If a project is supporting very high levels of debt then small variations in key assumptions will typically result in unacceptable degradation in debt cover ratios. As a result, the structure of the financing may have to be altered by decreasing debt or reducing the risk of variation of the particular assumption being tested. Sensitivity analysis often performs an essential function during the bankability assessment of a project financing. If sponsors can demonstrate that the project cashflows are not especially sensitive to a particular risk then it becomes difficult for lenders to argue that the risk is unacceptable and hence requires mitigation.

Whilst sensitivity analysis on single variables is useful for examining the impact of specific risks on the financial performance of a project, in reality the project assumptions are connected to some degree and changes in variables cannot be considered in isolation. Lenders often want to examine the result of negative variations to several inputs at the same time. This is known as a worst-case scenario and is designed to stress the financial performance of the project.

16.6.2 Debt Break-Even

Debt break-even calculations involve adjusting individual assumptions to a level whereby the project cashflows are just able to service debt. The assumptions may be adjusted to give a break-even on any of the debt ratios, including debt-service cover ratios, loan life cover ratios and project life cover ratios. Debt break-even analysis focusing on crude oil, natural gas and product prices is especially common for projects in the oil and gas industry. The debt break-even crude oil price for an upstream project is, for instance, indicative of the competitiveness of the project and its ability to withstand periods of low oil prices. It is also common to analyse margin debt break for refinery projects.

There are a number of issues that need to be addressed when running debt break-even sensitivities. The financing structure can have a very strong influence on the break-even level. If a repayment schedule includes a deferral option then the treatment of the deferral must be established prior to running the break-even case. Obviously the ability to defer a portion of the repayments due in any particular period will allow the project cashflows to fall to lower levels. The ability to use any cash reserves will also impact the level of debt break-even. If the debt break-even calculation allows cash reserves to be used to service debt then the debt break-even values calculated in any particular period should be significantly reduced. Finally, if a project produces multiple products it can become difficult to sensibly analyse debt break-even levels on individual product prices. A natural gas project, for instance, may produce gas for sales into a regulated domestic market and condensate for export. A break even on the gas price will be impacted by the condensate price assumption and vice versa. The results of any particular break-even calculation therefore need to be treated with some care.

16.6.3 Other Decision-Making Methods

Sensitivity and break-even analysis are the most common methods of analysis for project finance transactions. These methods rely on a deterministic rather than a probabilistic approach to cashflow forecasting. Although it is possible to model project cashflows using probabilistic techniques, including, for instance, Monte Carlo simulation, in practice these techniques are rarely encountered in the project finance models that are used to raise senior debt from traditional sources.

Chapter 17

Finance Structures and Terms

Chapter Outline

17.1 INTRODUCTION

Having covered project finance risk analysis and cashflow forecasting in the previous chapters, the purpose of this chapter is to look in more detail at the structures of oil and gas project finance transactions. We have already seen that there is no standard project finance structure and that each transaction is tailored to the risk profile and economic characteristics of the particular project being financed. Notwithstanding this variability in structures, some general characteristics can be identified in different industry sectors. The following sections will thus describe the project finance structural features most commonly encountered in the oil and gas industry.

Section 17.2 provides a general overview of financial structuring for oil and gas project finance. The features that define a project financing include: the level of debt, the mechanics for funding project costs and the structure of debt servicing and dividend payment.

Section 17.3 examines the factors that influence the level of debt which a project can withstand and the resulting capital structures commonly found in oil and gas industry projects. The main determinant of capital structure is the stability of the project cashflows and this varies depending on the underlying commercial structure of the project. It will be seen, however, that given the high degree of commodity risk in the petroleum industry, higher levels of equity are generally required compared to other industry sectors.

Section 17.4 then considers the funding, repayment and maturity of project finance debt while Section 17.5 examines the costs of funding.

Section 17.6 looks at lender control over the business and financial activities of project companies. Finally Sections 17.7 and 17.8 consider the types of sponsor support and security arrangements for oil and gas project finance transactions.

17.2 OVERVIEW OF FINANCIAL STRUCTURING

The risk profiles and cashflows of oil and gas projects vary considerably throughout the industry value chain. Some projects generate relatively certain and steady cashflows while others are highly risky and are exposed to the volatile fluctuations of global commodity prices. As a consequence, project finance structures display significant variation throughout the various sectors of the industry. In general, the following features broadly characterise financial structures in the oil and gas sector.

- *Capital structure*: Capital structure is a function of the relative proportions of debt and equity used to fund a project. The capital structure for any particular project will depend to a significant extent on the degree of project risk together with the cost and availability of the various different sources of finance.
- *Composition of debt*: Project sponsors are usually faced with a variety of debt funding options, each depending on the specific characteristics of the project. In general, large projects have a more complex mixture of multi-sourced debt.
- *Drawdown, repayment and final maturity*: The drawdowns, repayments and final maturity of a project finance loan determine the debt cashflows and hence the debt service cover ratios.
- *Cost of funds*: The overall cost of funds is a key factor in determining the most appropriate finance structure. Given the high levels of debt in most project finance transactions, loan costs represent an especially significant component of project cashflows.
- *Covenants and control mechanisms*: Project lenders will want to ensure that the project is properly managed and they will expect the finance structure to include mechanisms controlling cashflow, business activities and financing activities.

- *Sponsor support and credit enhancement*: The level of sponsor support and credit enhancement is an important feature of project finance transactions. The level of support required will depend to a large extent on the bankability of project risks and the economic impact of providing support.
- *Security*: Finally, the extent to which lenders are able to take effective security interests in the project assets impact the structure of the financing.

The volatility of the underlying project cashflows, the availability of specific sources of financing, the procurement strategy for the project, the life of the underlying project, the project location, the state of the wider financial markets and general lender risk appetite will all influence the aforementioned characteristics of a project finance transaction.

17.3 CAPITAL STRUCTURE AND THE COMPOSITION OF DEBT

Although project sponsors will typically want to raise the largest amount of debt possible, there are in practice a number of constraints on debt capacity. It has been shown in Section 1.5.1 that the minimum debt cover required by lenders is the principle factor that determines project finance debt capacity. Other factors influencing debt capacity are also examined further in the following sections.

17.3.1 Factors That Influence the Sizing of Debt

Project lenders will want to ensure that funds from sources other than senior debt are sufficient to cover any cash shortfalls that may arise during the life of the project. Equity acts as a buffer or cushion during periods of lower than expected cashflows. The higher the risks to cashflows, the larger the buffer lenders will require and hence lower project gearing and this translates into higher coverage ratios which the project cashflows will need to accommodate. A general feature of the project finance is the wide range of gearing levels that are encountered across the various industry sectors. Although gearing levels of 90% or more can often be achieved for projects with predictable cashflows, these levels of debt are rarely achieved in the oil and gas sector. High debt levels for project finance transactions are usually associated with infrastructure projects, particularly those where the cashflows are derived from contracts with public sector counterparties in strong jurisdictions. For projects exposed to greater levels of cashflow volatility in more difficult jurisdictions, lenders may only be prepared to lend up to a maximum of 50% of project costs. Typical debt levels for oil and gas projects and the key factors driving these are summarised as follows:

- 80 to 90% gearing for pipeline or gas storage projects with firm long-term offtake contracts with strong contract counterparties.

- 70 to 80% for LNG projects with strong coverage ratios and offtake contracts and credible break-even points. Process plant with tolling structures also able to borrow at these levels.
- 60 to 70% for strong petrochemicals and refinery projects which show very robust competitive advantage.
- 50 to 60% for merchant refinery projects.

The actual level of gearing achievable in practice for a project will, however, ultimately depend on the forecast project cashflows and the minimum cover ratios which are acceptable to the lenders.

17.3.2 Composition of Debt

Once the capacity of the project to take on debt is better understood, the focus can then move towards the actual composition of the debt and the mix of the financing. There is wide range of debt structures and final financing will ultimately depend on the cost and terms of individual sources of financing. At one end of the spectrum the financing could comprise a relatively straightforward commercial bank loan from a modest group of banks. Although some small projects have been financed by only two or three banks, it is more often the case that larger bank syndicates of ten or more are put together. As the size of the financing increases so does the composition of the bank group. At the other end of the spectrum the largest oil and gas financing have raised debt in excess of US$ 10 billion. These transactions require a multi-sourced approach and for the largest projects sourcing of funds can come from a bewildering range of sources, including Export Credit Agencies, commercial banks, capital markets, development finance institutions, local banks and specialist sources such as Islamic finance. Despite the large number of institutions involved, the process for arranging these very large financings is normally based around preliminary negotiations of terms and conditions with a small group of core institutions (which can often be export credit agencies). Once the key terms and bankability structure of the financing has been determined, a wider group of banks is approached to negotiate the final terms and agree the pricing.

A recent feature of large oil and gas project finance transactions is the use of sponsor senior loans. These loans are typically made by the sponsors on the basis of terms that mirror the other tranches of debt and have in general represented only a minority share of the funding composition. It is possible, however, that a transaction could be funded on the basis of a majority financing from sponsors. This would significantly increase the complexity of structuring these loans into a project financing. The sponsor lenders would in all likelihood be conflicted in any lender decision making process and, as a result, the voting mechanisms will needed to be carefully structured and negotiated to ensure that the financing is bankable for any minority third-party senior lenders.

The capital structure may include additional elements which often need particular consideration to ensure that their inclusion does not create unnecessary complication. Common examples include working capital, VAT and inventory facilities.

17.4 FUNDING, REPAYMENT AND MATURITY OF DEBT

The method of funding project costs during the development period and the mechanisms for repaying debt during the operating period are fundamental features of a project finance structure. The following sections consider these structural aspects in more detail.

17.4.1 Funding During the Development Period

An unusual feature of project finance is that the drawing of loans takes place over an extended period of time, the objective being to match the use of loan proceeds to project costs. The development period for projects in the petroleum industry can extend over several years and this has important implications for the structuring of funding during the development period. Figure 17.1 illustrates the most important time periods and milestone dates during the development period.

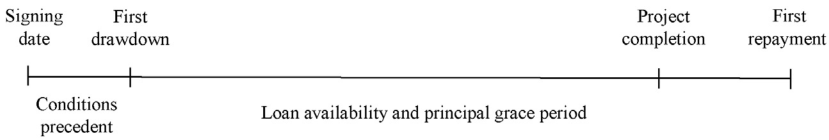

FIGURE 17.1 Principal loan milestones during project development

There are a number of important terms that are typically used to define the structure of project finance loans during the development period.

- *Signing date*: The starting point of the financing is the time at which the various parties sign and execute the various finance documents. Prior to this date, enforceable agreements between all the various project parties do not exist. In addition to the finance documents, the major project contracts will also usually need to be effective to ensure that the commercial structure of the transaction is in place.[1]
- *Conditions precedent*: A borrower is not able to draw funds until various specified conditions have been fulfilled. A more detailed commentary on common conditions is covered in Section 19.5.1. In general, however, oil

1. In practice, it may be that certain project agreements are not finalised prior to signing of the finance documents. It has been known, for instance, for the signature of supply agreements, licence agreements and even major construction contracts to have taken place after the signing of loan documentation. This situation exposes project lenders to significant risk, especially given that contract terms may change as a result of ongoing negotiations. As a result, in such cases the financing structure will need to include features designed to mitigate the risks to lenders associated with the lack of any incomplete project documentation. The release of any sponsor completion guarantees will, for instance, usually be conditional on satisfactory completion of any outstanding commercial agreements.

and gas project finance transactions will involve many different conditions, the fulfilment of which can be time consuming and resource intensive.[2]

- *Availability period* is the time during which the borrower can request funds under the loan agreement. At the end of the availability period the borrower is unable to access further funds under the loan facilities. It is thus important to ensure that this period is long enough to allow access to loan drawings during the development period.
- *Grace period*: This is the period of time during which the borrower is not required to make principal repayments of the debt. It would not make sense to structure in debt repayments during the availability period as the borrower is still drawing funds under the facility. The availability period and grace period are thus often coterminous.
- *Project completion*: Once project completion occurs the grace period comes to an end and the borrower should then start to make principal repayments according to the documented repayment schedule. The availability period will also have ended by the time the project is complete.
- *First repayment*: The first repayment date is the date when the borrower must start to pay back loan principal (otherwise the loan will be in default). The loan documentation will normally include a specific date, known as the 'long-stop date', for project completion and first repayment. If the long-stop date is reached and project completion has not been achieved then an event of default will usually occur.

The above terms are mainly concerned with the drawing and repayment of principal. The other important element of the debt financing is, however, interest and this is also treated in a special way for project finance loans. During the availability period loan interest is not paid by the borrower but capitalised and added to the outstanding loan balance. Interest payments will then start to be made on the first repayment date.

Tied Financing and Project Bonds

There are several additional structural complexities during the pre-completion period that need to be considered and can be challenging to negotiate. For multi-sourced financings, the specific conditions relating to the drawings of separate loan facilities often differ. ECA facilities, for instance, are typically drawn to fund eligible costs incurred under specific export contracts. This is known as 'tied' financing and can create difficulties relating to the timing of loan drawings. Lenders usually expect the various funding tranches to be drawn on a fixed proportional or 'pro-rata' basis. This may not in practice be possible if a

2. It has been known for the time required to fulfil conditions precedent to take several months or longer. During the period between signing and first drawdown, lenders are committed to lend and will hence charge commitment fees on the full amount of committed funding.

funding source is tied to specific costs. Although lenders usually show a reasonable degree of flexibility when considering deviations from pro-rata drawings, negotiations can be difficult if the deviations are expected to be significant and result in considerable imbalances between the various facilities.

For project bonds, the concept of multiple drawings does not exist. Once the bond has been issued the funds are immediately distributed by the lead manager and hence are immediately available. Normal practice is for the bond proceeds to be deposited in an interest bearing account for use as required. This does, however, mean that the project company will be paying interest immediately on the full amount of the bond and it is unlikely that interest received on the deposited funds will be sufficient to cover the coupons on the bond. This additional financing cost is known as 'negative carry' and it is one of the most important disadvantages of using bonds for project finance. Some structures have been developed which involve the project company issuing bonds on an ongoing basis during the funding period. This does not, in reality, resolve the problem, however, as the other lenders to the project are unlikely to take the risk that the bond issuance is either not possible or becomes more expensive. Lenders will still want to see, therefore, that the project is fully funded at the time of signing.[3]

On-Loans

On-loan structures involve a project company borrowing funds pursuant to the project financing facilities and then on-lending these funds to another entity which is responsible for developing associated facilities. As an example, a gas or LNG export project may be separated into a midstream processing component and upstream field development component. The midstream component may be structured as an incorporated joint venture and acts as the borrower of the project loans for the full-integrated project. The upstream component may be structured as an unincorporated joint venture and the upstream joint venture partners are funded through on-loans from the midstream project company. Although other on-loan structures are possible, the major issues associated with this type of funding arrangement are similar.

The mechanisms for dealing with the funding of on-loans during the availability period need to be carefully considered to ensure that the lenders to the project are not put into a worse position than otherwise. If they are, then they are unlikely to accept on-lending. The basic principle of the on-lending structure is that the main project loan facilities will be replicated by facilities between the project company and the ultimate borrowing entity. The terms of these on-loan agreements will need to mirror the terms of the main project finance facility.

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3. In recent transactions lenders have shown more flexibility regarding the timing of issuance of bonds for projects. In some cases, particularly where a large and liquid capital market exists, lenders have committed to finance projects that are not fully funded due to pending project bond issuance. Certain mitigation measures may still be required, however, including sponsor commitments to fund if bond issuance is not possible.

Lenders will also want to ensure that any funds drawn under the project finance facility are properly disbursed to the ultimate borrower. The free cashflows generated by the project that is the subject of the on-loan funding will be used to repay the outstanding on-loan principal back to the project company according to the scheduled repayment profile. The project company will then apply the funds received to make repayments due under the main project loan. Clearly the lenders are at risk that the project cashflows are insufficient to make repayments as they fall due. The on-lending structure does, therefore, add a further level of risk to the project finance structure. There are, however, precedent transactions which have been successfully structured to accommodate on-lending and on-loans are thus becoming a more common feature of project finance structures.

Equity Funding

In addition to the funding mechanisms and structures for senior debt, the timing and funding of equity need to be addressed in the financing structure. There is no standard equity funding structure and the exact details of timing and mechanisms for funding will be determined through negotiation between the sponsors and the lenders. The principal concern of the lenders will however be to ensure that funding is available as required. The various types of funding for equity have been previously introduced in Section 2.3.2, including equity subscriptions from the shareholders, IPO proceeds, sub-ordinated loans and equity bridge loans. Whatever form equity takes, the senior lenders will usually expect the sponsors' funding commitments to be detailed in the loan documentation and properly reflected in the financial model.

17.4.2 Repayments From Operating Cashflows

Following the first repayment date, the borrower is under an obligation to repay principal and pay interest on a periodic basis, usually every six months. If debt is not serviced on time then the loan will be in default and the lenders will be able to exercise their rights under the loan agreement (including the initiation of bankruptcy proceedings and enforcement of security). Given that debt is serviced in priority to payments made to shareholders, the size and timing of the payments to lenders directly influences shareholder returns. A great deal of time is thus spent on structuring an optimal repayment profile to ensure that there is sufficient cover in each period to service debt and to ensure a reasonable return to shareholders.

There are many different ways of structuring debt repayment profiles and lenders have generally shown great flexibility in accommodating innovative structures. A commercial bank loan probably offers the most flexibility and commercial banks have historically tended to be the least constrained in their ability to accept innovative repayment structures. ECAs have less flexibility due to the various rules that are normally applied to many of their lending programmes. Project bonds are normally based on simpler repayment structures. The following sections summarise some of the more common project finance repayment structures.

Equal Principal

The simplest loan repayment profile involves equal principal repayments made during each debt service period. Repayments of a 10-year US$ 10 million loan would therefore equal US$ 1 million per year. Interest payable is highest at the beginning of the repayment period as it is at this time that the maximum loan amount is outstanding. As the loan is repaid, interest payment will fall. As a result, equal principal repayment does not generate level debt service but rather a front loaded profile whereby total debt service payments are highest on the first repayment date. This is not generally an efficient repayment structure for project cashflows and hence equal principal repayment is rarely seen in project finance transactions.

Annuity (or 'Mortgage Style')

An annuity is a constant series of cashflows over a specified period of time and at a particular interest rate. This style of repayment results in equal debt service for each period (in other words the combined interest payments and principal repayments are constant). At the end of the repayment period the last principal repayment fully repays the loan. Although the total amount payable each period is constant, the interest and principal components vary throughout the loan period. At the beginning of the loan the full amount is outstanding and hence interest payments make up the majority of the debt servicing. As more principal is repaid the interest component reduces.

Modified Annuity

The cashflows from a project are often not constant and hence the annuity style repayment profile is not normally the most efficient method of structuring the repayment of a project finance loan. Projects in the oil and gas industry, in particular, tend to have variable cashflow profiles. Upstream project cashflows reflect the variability of production from the reservoirs. Refining and petrochemicals projects have highly variable gross margins. Furthermore, the ability of a project to generate cashflows in any period is often strongly impacted by the cyclical costs and shutdowns associated with scheduled maintenance. To accommodate the predicted variability in cashflows it is thus more common for the annuity repayment profile to be modified in particular periods.

Target/Minimum Repayments and Deferrals

The aim of a target/minimum repayment profile is to allow the borrower flexibility in making repayments throughout the period of the loan. In each debt service period cashflows will be dedicated to meet the target repayment profile. If the borrower fails to meet the target repayment profile, however, there is no default. Rather, all cashflow is dedicated to debt service until the target repayment profile is met. In other words, distributions are prevented. A payment default will only occur if the borrower is unable to meet the minimum repayment profile. The minimum profile usually results in an amount of principal being left outstanding at final maturity and hence the lenders are exposed to an element of risk in this structure.

It is also now common for oil and gas project finance loans to include provisions to allow the borrower to defer an element of principal repayment. If the borrower is unable to service all its debt in a particular period then a portion of the repayment due may be deferred without the borrower defaulting. The maximum amount of deferral is usually set at 10 to 15% and deferrals are not usually allowed in the final two instalment periods of the loan. Deferrals are not allowed if the borrower is already in default. In addition, other restrictions are normally imposed on the borrower whilst any deferred principal is outstanding, including constraints on payments to shareholders and sponsors.

Balloons and Cash Sweeps

A cashsweep mechanism is related to the target/minimum profile. The borrower is obliged to make repayments according to a fixed repayment profile. The cashsweep operates by using excess cashflows to make pre-payments of debt over-and-above the scheduled profile. Excess cashflows may apply to all available cash following scheduled repayments. Such a mechanism is referred to as a '100% cashsweep'. Alternatively excess cash may be applied to only a proportion of cashflows, such as, for instance, a '50% cashsweep'. The cashsweep mechanism is generally used to reduce the tenor of the debt by making prepayments to later period repayment instalments. Cashsweeps may also be time limited or triggered by certain events. The cashsweep is thus a very flexible form of debt structuring but it must be understood that any cashsweep could significantly reduce any payments to sponsors and hence may have a very significant impact on sponsor returns.

A further refinement on the structuring of repayment profiles is the concept of a balloon. A balloon occurs when the scheduled principal repayments during the term of the loan are less than the total amount of the loan, leaving a remaining balance, or balloon, to be paid at the final maturity date. The size of the balloon is usually expressed as a percentage of the total loan amount. Hence a 50% balloon means that half of the loan remains outstanding at the end of the loan term (or to put it another way the scheduled repayments have only serviced half the principal amount). A 100% balloon means that no debt repayments have been made. This is usually termed a 'bullet' repayment and is common in corporate finance but rare in project financing.[4]

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4. The application of the bullet repayment concept to project cashflows illustrates the difference between corporate and project finance loan structures. A corporate entity is generally assumed to have indefinite or unlimited existence and hence a corporate loan can be serviced on an ongoing basis. In theory, therefore, a company should be able to refinance a loan at maturity on the basis of its continuing existence and ability to generate operating cashflows. In contrast, a project has a definite life following which cashflows cease and hence loan servicing must be made during the life of the project. Lenders relying on project cashflows to service a bullet repayment are therefore exposed to significant refinancing risk.

Cover Ratio Driven Debt Reduction

Principal repayments are often made by reference to a particular cover ratio. A minimum cover ratio is stipulated in the loan agreement and in each period a principal repayment amount is calculated to ensure that this cover ratio is achieved. The LLCR is the most commonly used ratio although the PLCR is also often encountered. Cover ratio driven debt reduction forms the basis of the borrowing base facility debt structures that are often seen in upstream oil and gas financing.

17.4.3 Commitment Cancellation, Prepayments and Replacement Debt

Project finance structures will typically allow borrowers flexibility to cancel commitments during the availability period and make early prepayments of principal during the debt service period. In certain circumstances borrowers may also be required to make mandatory prepayments. A number of issues usually need to be addressed when negotiating the permitted level of flexibility to cancel and prepay loan amounts.

- *Cancellation*: Although lenders will usually allow project borrowers flexibility in their ability to fully or partially cancel facilities, there is a risk that cancellation leaves a project under-funded. As a result, lenders will only accept cancellation for good reason and with assurance that acceptable alternative finance is available to cover any resulting funding shortfalls. In certain circumstances, automatic cancellation of facilities may occur, including as a result of default, enforcement, acceleration, illegality and so on.
- *Voluntary prepayments*: Prepayment of syndicated loans can usually be made without cost provided that the prepayment occurs at the end of an interest period. If prepayments are made within an interest period then lenders will normally charge breakage costs, the calculation of which is generally specified in the loan agreements. Prepayment of other kinds of debt can result in the payment of significant prepayment fees. The early redemption of a fixed rate bond, for instance, will normally require the project company to reimburse bondholders for future loss of income. If a prepayment is made to a loan facility then the application of the prepayment amount to the repayment schedule needs to be agreed. In broad terms prepayments can either be applied to the latest scheduled repayments, thereby reducing the tenor of the loan, or to each scheduled repayment on a pro-rata basis. Lenders prefer the first option although in general will agree to pro-rata treatment.
- *Mandatory prepayments*: Project finance loan agreements will usually include provisions obliging the borrower to fully or partially prepay loan amounts if certain specific events occur. In general mandatory prepayment must be made if the loan becomes illegal, if insurance or compensation payments are received by the borrower or if certain specified ratios fail to be met. Other project specific events may also trigger prepayment obligations.

Voluntary cancellation and prepayments are particularly relevant in circumstances whereby the borrower is seeking to refinance or replace loan facilities. Many oil and gas project finance structures allow the borrower to raise further debt to partially or fully replace existing project loans. This is a useful mechanism to allow borrowers to raise attractive funding that may not be available at the time of initial financial close.[5] The existing lenders will normally impose certain conditions on the terms of any replacement debt to ensure that the initial financing structure is not eroded. The conditions typically include: demonstration that minimum debt cover ratios are maintained, restrictions on the terms of the new debt[6] and agreement by the new lenders to enter into the existing security and intercreditor arrangements. Naturally if all of the existing loans are prepaid or cancelled then the conditions will be redundant.

17.4.4 Final Maturity Date and Loan Tenor

The tenor and maturity date are vitally important in project finance transactions and represent essential variables in the optimisation of debt structures. A longer maturity date results in lower principal repayments in each period during the loan term. As a result, total debt service in each period is reduced and coverage ratios increased. For a given free cashflow profile, therefore, a project should be able to support a larger proportion of debt if the debt tenor is extended.

There are a variety of factors that influence debt tenors in project finance. The longer the tenor, the more time lenders are exposed to project risks. Loans to riskier projects thus, in general, have shorter tenors. The loan tenor will also be strongly influenced by the expected project life and the forecast cash generation of the project. Because oil and gas reservoirs naturally deplete, for instance, loan tenors in the upstream industry tend to be shorter. This obviously depends on the production profile of the project. The expected life of a project is not only dependent on the physical project assets but also the project contract terms. A storage project with short-term usage contracts will have challenges raising long-term debt, for instance. A pipeline with a long-term ship-or-pay transportation agreement, on the other hand, should be able to raise longer-term loans. In this case, however, much will depend on the credit-worthiness of the shipper.

Other factors that influence debt tenors include the ability to forecast forward key project parameters for extended time periods and the overall level of country risk to which a project is exposed. Forecasting commodity prices, refinery margins and the like over ten, fifteen or even twenty years is obviously fraught with difficulty. Lenders will need very strong project fundamentals to

5. A borrower may, for instance, want to access the debt capital markets at a later stage. In addition, certain potential lenders may not be able to get full approval to lend in time to join the initial closing.

6. Existing lenders will usually want assurance that any new debt is incurred on terms that are no more restrictive compared to any existing loans which are not replaced. The tenor of the new debt should, for instance, be no shorter than existing debt (usually by reference to the average loan life) and the loan covenants should not be more restrictive.

accept tenors of this length when confronted with full price risk. In addition, understanding the long-term risks of operating in unstable or difficult jurisdictions can be extremely difficult. The location of the project can thus act as a significant constraint on debt tenors.

Finally, commercial banks have seen the costs of funding long-term loans increase in recent years. The regulatory capital requirements for longer-term lending have increased and, as a result, commercial banks are less willing to lend long-term. In practice this has resulted in higher loan costs for longer tenor lending although given strong bank demand, the pricing increases have been less than anticipated.

17.5 COST OF FUNDS

For the project sponsors, perhaps the most important objective of financial structuring is the minimisation as far as possible of funding costs. For large projects, finance costs can amount to hundreds of millions of dollars which need to be paid from project free cashflows. US$ 7 billion of debt for a greenfield refinery could, for instance, involve the payment of upfront fees and premiums of up to US$ 100 million and half-yearly debt service of US$ 500 million. Access to low-cost capital is therefore a source of significant competitive advantage. The cost of funds for project finance transactions is a function of many factors, including the funding currency, the overall level of interest rates in the economy and general sentiment in the wider syndicated loans market.

17.5.1 Loan Interest

The interest rate that lenders charge for project finance loans is determined by their own cost of funds plus an additional margin to compensate lenders for credit risks. We have already seen in Chapter 4 that cost of funds in the wholesale banking market is typically determined by reference to LIBOR. We have also seen that the pricing of project bonds is based on the rates for government bonds of a similar maturity. The cost of funds for a project finance loan will therefore reflect the general wholesale banking market funding costs and government cost of funding in the particular currency being borrowed.

The margin that lenders charge reflects the riskiness of a particular loan and is usually determined by supply and demand in the syndicated loan markets. Margins are typically set pursuant to a competitive bidding process. When asked to provide loan margin quotations lending banks will usually refer to recent market precedents, including actual pricing achieved by borrowers in the same country and/or sector for loans of similar tenor, credit rating (if applicable) and currency. The loan margin is usually quoted as a number of basis points above LIBOR and will often vary throughout the term of the loan. During the pre-completion phase of a project, for instance, loan margins may be higher reflecting the increased risks during this period or lower if the lenders benefit from strong completion guarantees. During the operating period lenders may quote increasing or 'ratcheting' loan margins over time to incentivise refinancing.[7]

In general, for oil and gas project finance loans margin levels have varied between around 50 bps and 400 bps depending on the market at the time, the sponsors and the type of project.

17.5.2 Fees and Premiums

Lenders charge a variety of loan fees, including front-end fees, which are typically quoted as a number-of-basis points on the total loan commitment amount and paid to the agent bank on the first drawdown of the facility. The agent then distributes the fees to the lending group. The different fee structures in the syndicated loans market are explained further in Chapter 4. In addition, lenders charge commitment fees during the loan availability period. These fees are calculated on the amount of available but undrawn commitment under the relevant facility and are usually paid quarterly in arrears. Availability periods that are commonly encountered in project finance transactions are usually long and in multi-loan financing some facilities may remain undrawn for a considerable period of time. As a result, commitment fees can be a significant cost to the project. Export credit agencies, insurers, guarantee providers and issuers of letters of credit will also charge various fees and premiums. The levels of these fees can be significant and will reflect the relevant risks and structures of the underlying transaction.

The loan agents and trustees will also charge a variety of fees which are usually quoted as a fixed amount per period, usually annually. The larger and more complex the funding structure, the higher the agency costs.

17.5.3 Other Costs of Funding

In addition to interest, fees and premiums, there are a variety of other funding costs that can materially add to the total finance cost. Withholding taxes can have a significant impact on the costs of funds. In many jurisdictions taxes are withheld from interest payments made to non-domiciled lenders. Common practice in the international loans markets is for borrowers to gross-up interest payments so that the net amount received by the lenders after the payment of withholding taxes is the same as it would have been if there was no withholding tax. The borrower is, therefore, absorbing the taxes and thereby increasing the costs of borrowing. In addition to withholding tax, certain institutions may be subject to regulatory costs that are commonly passed through to borrower

7. A 15-year loan may, for instance, be quoted with an initial margin for the first 5 years of 100 bps which increases from 6th year to 10th year to 150 bps and thereafter rises to 200 bps. The ratcheting on the margin by 50 bps is a significant incentive for refinancing, especially if the project is successful and has developed a strong track-record.

pursuant to the specific terms of loan contracts.[8] Borrowers will usually want to retain the ability to prepay amounts due to individual institutions that are subject to withholding taxes or additional regulatory costs. In addition, the lenders are also usually obliged to mitigate as far as possible the impact of these additional costs (through, for instance, making changes to the location of the booking office for a loan and so on).

17.5.4 Refinancing

The financing structures, interest margins and fees agreed between the borrower and project finance lenders reflect the particular conditions existing at the time of initial funding. The life of a project usually extends over a significant period and market risk appetite and finance costs can vary quite considerably during the term of a project loan. It is hard to imagine, for instance, that changes will not occur in financial market conditions during the course of a twenty year loan. In addition, once a project is complete and starts to develop a successful operating track record the lenders will generally take a more positive view on project risks and the borrower credit profile. Project sponsors will therefore often look to refinance project finance loans to take advantage of potentially more favourable conditions. The benefits of refinancing could include:

- Lower costs of funds, particularly reduced credit margins.
- More favourable financial structures, including weaker covenants, lower levels of lender controls, diluted security (translating into lower levels of cash reserves, relaxed cover ratios and so on).
- Longer debt tenors and more favourable repayment schedules.

There are, however, a number of impediments to refinancing that need to be carefully considered and, if possible, catered for in the initial financing structure. Provisions should be built into the loan agreements to allow the borrower to partially or fully prepay loans. If the loan has an associated interest rate swap then the swap notional amount may need to be reduced and this could involve additional costs to 'unwind' the swap. Furthermore, certain sources of debt often offer less prepayment flexibility. Project bonds, for instance, often require breakage payments that include an element of lost profit. These costs can be significant depending on the interest rate environment. Some ECAs and DFIs have also traditionally constrained borrowers' ability to refinance.

8. The relevant clauses in a syndicated loan are commonly termed 'mandatory cost clauses' and have traditionally been subject to standardised calculations based on the LMA's Mandatory Cost Schedule. However, more recent developments in the calculation of regulatory costs for individual banks has meant that the mandatory cost provisions are now more commonly tailored to the individual circumstances of particular institutions. Standardised mandatory costs clauses are thus less likely to be encountered in the current loan markets.

17.6 LENDER CONTROLS

Without some control over a project the lenders are exposed to the risk that activities are not managed in their best interests. Decisions may be taken by the project sponsors that are aimed at increasing shareholder returns but at the same time increase the risks to lender debt service. As an example, the sponsors of an upstream development project may proceed with the project as agreed with the lenders. Once the project is complete, however, the sponsors may be incentivised to take more risk by undertaking further appraisal well drilling on other parts of the licensed area with a view to increasing equity returns. The project lenders will not share in the increased returns but will see erosion of the cashflow cover for debt service due to the need to fund the additional drilling costs. To prevent this situation arising lenders impose a variety of controls on the borrower through an extensive set of loan covenants. The negotiation of these covenants is commonly the source of significant tension between the project sponsors and lenders. A careful balance needs to be found between the lenders requirement to ensure that project risks are properly managed and monitored and undue interference by lenders in the proper operation of the project.

17.6.1 Controls Over Cashflow

Given that project finance lenders are looking principally to project cashflows to service their debt, they will want assurance that these cashflows will be managed properly. As a result, lenders typically impose a variety of controls over the project cashflows. The primary aim of these controls is to ensure that cash does not 'leak' out of the project either through uncontrolled payments from the borrower's bank accounts or through excessive spending on project costs. The control structures often seem onerous to sponsors and stronger and more experienced sponsors will normally negotiate hard to weaken some of the more draconian cashflow control measures. In general, however, lenders will seek to exert control through budget approval mechanisms, specific onshore and offshore project account structures and a defined priority of payments from bank accounts.

- *Budget controls*: Lender budgetary control mechanisms seek to ensure that the project company only spends funds on lender approved costs. These controls usually take the form of pre-approved budgets which are generated from the base case financial model. Provided the project company maintains expenditure within the approved budgets then costs can be paid without further lender input. If, however, costs are likely to be exceeded then lender approval is usually required. Tolerances are typically agreed on an annual basis. The borrower may, for instance, be able to exceed budgets by 10% each year without having to revert to lenders for approval. Lender approval of budgets can become a highly contentious issue, especially in upstream field development projects where the budget is in reality set by the operator.

The ability of the project company to control expenses can be significantly reduced and the terms of the relevant joint operating agreement will usually prevail. As a result, there has been a trend towards weakening lender control over project costs, especially in upstream projects. Lenders will, however, still want assurance that costs will be properly controlled and that capital and operating cost overruns are unlikely to jeopardise debt service.

- *Account structures*: The onshore and offshore account structures and cashflow waterfalls for oil and gas projects are similar to those commonly found in other sectors. The general concept is that project revenues are deposited in segregated accounts preferably in offshore jurisdictions (typically London or New York). These accounts are secured in favour of the senior lenders. Payments out of the revenues accounts are made according to a pre-defined waterfall which usually involves funds being remitted to defined operating accounts for the payment of specific costs. Various special accounts will also be opened to accept funds relating to insurance, compensation payments and so on. The funds in these accounts will normally be controlled by the lenders and used for specific purposes. Finally a variety of reserve accounts will be established to build up cash reserves within the project company, the most important being the debt service reserve account and maintenance reserve account.

Project finance bank account structures are covered in further detail in Section 19.4.4 and the use of cash waterfalls has previously been explained in Section 16.2.3.

17.6.2 Controls Over Business Activities

As well as project cashflows, lenders will also want to control the activities of the borrower by imposing obligations to do and not do certain things. The primary objective of these controls is to ensure that the project company only engages in the activities that have been originally presented to the lenders. We have already seen that lenders spend an enormous amount of time on project risk analysis and due diligence. If the borrower then starts to undertake activities that are outside the original project scope then the whole due diligence concept is undermined. As an example, assume that lenders have financed the development of an upstream project which will sell gas pursuant to a long-term contract with a government offtaker. The project sponsors then discover oil located in adjacent but unrelated reservoirs and decide to develop these reserves using the project company. This would expose the lenders to cashflow risk that have not been analysed or accepted as part of the negotiations conducted for the initial loan commitments. Typical covenants that are aimed at controlling business activities, include:

- *Corporate structure*: Lenders will prohibit any changes to the corporate structure of the project, including reorganisations, mergers and acquisitions activities, establishing subsidiaries and so on.

- *Project contracts*: The project company will be restricted in its ability to make changes to project contracts. Lenders will also often expect to exert a degree of influence on decisions made pursuant to project contracts (the areas where lender input is required into commercial contract decisions are known as 'reserved discretions'[9]).
- *Restrictions on investment activities*: The borrower's investment activities are usually strictly controlled. This will typically include a prohibition on acquiring shares in other companies, establishing subsidiaries and so on. The financing structure will, however, normally allow the borrower to invest surplus cash in 'permitted investments' being investments normally in short-term, highly rated and publicly listed securities.

Lenders will also impose wide reporting obligations on the borrower, including the provision of regular construction phase progress reports (monthly or quarterly), operating phase reports (semi-annually or annually), reserves reporting, environmental reporting and reporting of any material events which are likely to impact the project. The various lender consultants may also be required to provide ongoing reporting during the life of the project. The technical consultant will, for instance, visit the project site at regular (usually quarterly) periods during the construction period and will be present during testing of the project. The reserves consultant will usually provide updated reserves reports and the environmental consultant also typically provides ongoing reports on environmental compliance. The information obligations are particularly extensive in upstream financings which are based on borrowing base calculations. The borrowing base is usually redetermined every six months and this exercise entails a full update of the financial model assumptions.

Ownership Transfer Restrictions

One of the most important areas of lender control relates to the shareholding and sponsorship of a project. Ideally lenders would like to see the existing sponsor group maintained throughout the life of the loan. This reflects the importance attached by lenders to project sponsorship as examined in Section 15.3. A sponsor may be providing specialist expertise in the management, operations, technology, product-marketing or local knowledge. In practice, however, many sponsors want to ensure that they have some flexibility to reduce their ownership stake in the project. Negotiation of the minimum level of sponsor ownership can become a source of considerable tension during the structuring of a project finance transaction. It is, however, important for sponsors to understand the importance attached by the lenders to the maintenance of project ownership and to aim for

9. If included in a project finance loan structure, reserved discretions are typically the subject of a specific schedule to the loan agreement whereby the relevant clauses of key project contracts are referenced. The restrictions placed by lenders on the relevant decisions, discretions, options or actions are also specified in the schedule.

a reasonable compromise position during negotiations. Lenders will normally strongly resist any dilution of sponsor ownership during the construction phase of the project. If sponsors are allowed to transfer ownership during the pre-completion period then the lenders will want to ensure that any financial obligations can continue to be satisfactorily supported by any new sponsor. The ability of a new entity to fund any equity contributions, honour any completion support arrangements and so on will be carefully scrutinised by the project lenders. In general, detailed rules and procedures regarding ownership transfer during the pre-completion period will need to be documented in the loan agreements.

Post-completion, lenders will normally allow a greater level of flexibility. They will, however, want to ensure that any specific sponsor expertise, support and so on that may be lost due to ownership dilution can be undertaken by a replacement entity with comparable resources and expertise.

Ongoing Capital Expenditure and Expansion Projects

Capital spending does not stop at project completion. Ongoing capital investment will usually need to be made throughout the life of the project and is, in fact, invariably essential to maintain project revenues. An upstream project will, for example, almost certainly require continuing investment in reservoir management so that production levels can be maintained. Ongoing capital costs can, however, easily escalate out of control. Lenders will therefore expect strong budgetary controls over capital expenditure throughout the life of the loan.

We have already seen in Part II that LNG plants, petrochemical facilities and pipelines all have a history of project expansion. Project sponsors are therefore usually very aware of the need to ensure that there is sufficient flexibility in loan covenants to allow them to expand facilities if required. The starting position of project lenders is, however, usually a complete prohibition on changes to the business activities of the borrower, including project expansions. It should be clear, therefore, that negotiations over the ability of the project to expand can be difficult to navigate and compromise positions challenging to achieve. There are a number of precedent structures in oil and gas financing that are now accepted by lenders. The basic idea behind project expansion structures is to determine in advance the parameters pursuant to which project sponsors can undertake expansions and to agree the control and decision-making rights which lenders have if sponsors do undertake expansions. Lenders will be particularly concerned to ensure that the proposed expansion project will not have an adverse impact on the existing project. Lenders will thus expect to be provided with details of the expansion plans and for the various lender consultants to opine on the risks associated with the expansion plans. Lenders will also want confirmation that the expansion will be fully funded from external sources and that the new project will not need to rely on cashflow support from existing operations. If the financing arrangements involve the borrower raising additional senior debt to finance the project then lenders will attach conditions to this additional debt. These conditions will be explored further in the next section.

17.6.3 Controls Over Financing Activities

Lenders will want to ensure that the financial structure of the project is preserved and that the project company maintains its financial strength. The project company will thus usually be subject to various specific obligations which are primarily designed to restrict the borrower's ability to incur further debt and to prevent payments to equity and sub-ordinated sources of funding in priority to the senior lenders. Debt cover ratios are an important element of lender financial control mechanisms. The use of cover ratios is covered in further detail in Section 16.4.2.

Additional Debt Including Expansion Debt

Lenders have traditionally placed severe restrictions on the ability of the project company to raise further senior debt. Although this is still invariably the starting position, lenders now tend to allow project borrowers to incur certain categories of additional senior debt for defined purposes. The incurrence of additional debt is, however, usually strictly controlled through pre-agreed conditions that must be fulfilled prior to the debt being incurred. The most common category of additional debt is debt incurred to finance expansion projects. If allowed, the incurrence of expansion debt is normally subject to various conditions including:

- Prior to completion, a requirement that any lenders to an expansion project benefit from sponsor completion support and have no recourse to the assets or cashflows of the existing project until the expansion project is completed.
- Following completion, any sponsor completion support arrangements will usually terminate and the expansion lenders will share in the cashflows and security of both the existing and the expansion project. The expansion project lenders will thus be required to accede into the intercreditor arrangements with the existing creditors to the project.
- A requirement that a revised base case is developed which includes necessary assumptions covering the expansion project and expansion debt. The revised base case will need to demonstrate minimum coverage ratios that are acceptable to the existing lenders (this will usually mean that the cover ratios for the expanded project should be at least equivalent to those of the existing operations).
- A requirement that the terms of any expansion debt (covenants, tenor, pricing and so on) are similar to those of the existing debt. The existing lenders are unlikely to accept new lenders coming in to the project on better terms.

The basic aims of lenders when considering the arrangements for expansion debt are to ensure that the cashflows of the existing debt are protected as far as possible and that the cover ratios assuming the incurrence of expansion debt remain acceptable. Although the inclusion of expansion debt and expansion projects in the financing structure adds further complexity and risk, project lenders have tended to take the view that, for robust projects, expansion is a positive development, especially if the existing sponsors remain committed. Rather than standing in the way, therefore, lenders have attempted to negotiate structures that allow for expansion while at the same time protecting their existing interests.

Dividend Restrictions

Lenders also impose restrictions on the borrower's ability to pay dividends and make other payments to sponsors, shareholders and so on. Lenders will normally prevent dividends and similar payments being made prior to the first repayment of the senior loans. This is based on the concept that if a borrower has sufficient funds to pay dividends then it should firstly apply those funds to servicing senior. Dividend payments are also normally further restricted to ensure that the project company retains sufficient internal cash resources. The restrictions commonly take the form of minimum coverage ratio requirements before dividends can be paid. Any restrictions on dividends and other payments to sponsors will naturally have a significant impact on sponsor returns and hence are again usually a source of considerable negotiation between the sponsors and the lenders during the financial structuring phase.

17.7 SPONSOR SUPPORT AND OTHER FORMS OF CREDIT ENHANCEMENT

We have already seen that project risks can be transferred to other parties through commercial contracts and that lenders will spend a considerable amount of time examining these risks and the effectiveness of the commercial structure in transferring risks. Certain risks that remain with the project company, may not, however, be acceptable to the lenders and, as explained in Section 15.5.3, to achieve a bankable structure, other methods of risk mitigation may be required. Project sponsors will, for instance, often support projects in a variety of ways, both financially and through commercial arrangements. In addition, various forms of third party credit enhancement may be available to cover specific risks.

17.7.1 Sponsor Completion Support

Due to the size and complexity of many projects in the petroleum industry it is virtually impossible to fully transfer the completion risks through a single EPC contract. To achieve a bankable risk profile, therefore, sponsors are often expected to accept a degree of completion risk usually by providing some form of financial support until the project has achieved completion. Given the complex nature of oil and gas development projects, sponsor completion support is a common feature of project finance transactions in the industry. Although the exact nature of the completion support arrangements varies from project to project, there are a number of structural features which are commonly encountered.

Lenders are primarily concerned with the timely payment of debt service and delays in achieving project completion may threaten the project company's ability to make the first interest and principal payment. The principal aim of sponsor completion support is thus to ensure that scheduled debt service is paid whether or not the project company is in a position to honour its payment obligations. The most common method of achieving this is to require that the project sponsors guarantee scheduled debt service until the project completes. In addition to scheduled debt service payments, lenders also need assurance that in the event of acceleration of the loan, the full amount of the outstanding debt amount is also going to be honoured. The sponsor guarantees are also expected to cover the full amount of outstanding debt in the case of acceleration. A final, or long stop, date for completion of the project is typically agreed and failure to achieve this date will result in the lenders ability to accelerate the loan and recover the full amount of outstanding debt from the sponsors. Sponsor completion support arrangements will thus usually include the following features:

- A guarantee[10] provided by the sponsors on a pro-rata basis to cover ongoing debt service and all outstanding debt obligations[11] in the event of acceleration.
- The guarantee to be effective until project completion occurs at which point the guarantee obligations will terminate.
- In addition to financial guarantees, lenders may also expect the sponsors to inject further funds to finance any cost overruns.

This form of completion guarantee represents a potentially demanding financial commitment on behalf of the project sponsors. A number of important considerations need to be addressed, including the definition of project completion, the ability of the sponsors to honour their obligations and the impact of the guarantees on the underlying loan structure.

- *Completion definition*: Project completion needs to be carefully and precisely defined and the testing regime for assessing whether the project is complete needs to be agreed. For lenders, a project will be complete if it can reliably demonstrate that it can perform according to the underlying assumptions which are used to generate the base case cashflow forecasts. As a result, lenders will expect project completion to be defined by reference

10. There are a number of complex legal issues that need to be addressed when determining whether a particular financial support arrangement constitutes a guarantee. Furthermore, other terms are often used to describe financial support arrangements, including 'undertaking', 'indemnity' and so on. It is beyond the scope of this text to examine these issues in great detail. The parties to a project finance transaction should, however, be aware that support arrangements need to be carefully drafted with the input of specialist legal advice.

11. The exact scope of any sponsor guarantee or support will need to be carefully defined. All senior creditors should benefit, including, for instance, hedge counterparties and so on.

to the base case project assumptions. The scope of lenders' reliability testing has been covered in Section 12.3.3. Lenders will also usually expect a number of other requirements to be fulfilled as part of the completion-testing regime. The project will, for instance, need to demonstrate that satisfactory operational project insurances are in place and that all the necessary operational permits and approvals have been obtained.

- *Sponsor obligations*: The financial obligations pursuant to the completion guarantees are often extremely large and each sponsor will be expected to guarantee its pro-rata share of the guaranteed obligations. Lenders will thus want to understand the ability of the various sponsors to honour their obligations pursuant to the guarantees. In many joint venture arrangements one or more of the sponsors may not have sufficient financial strength to honour the full amount of potential exposure. Lenders will, however, typically look at the total package being offered to them and will ultimately need to take a view on the likelihood that the guarantees will ever be called for the full amount of the financing. A further complication that is often encountered involves the entities actually providing the guarantees. Many sponsors fund equity and provide guarantees through specially incorporated subsidiaries. This may be done for tax optimisation, accounting or legal reasons. These subsidiaries may not have significant financial resources of their own and, as a result, guarantees or other forms of support from the parent organisation will usually be required. The mechanisms for providing this additional support can add significant further complexity to the financing structure and will typically depend on the specific characteristics of the transaction.
- *Impact on financing structure*: Completion guarantees usually have a significant impact on the underlying structure of the financing. The events of default regime and covenants are usually restricted at the project level given that the lenders are ultimately looking towards the sponsors to honour the debt obligations. Additional events of default and covenants are usually required relating to the sponsors.

The completion guarantee arrangements explained earlier represent probably the most comprehensive support which lenders can expect to obtain from project sponsors. This type of sponsor support is, however, onerous and hence sponsors usually seek to restrict the scope of the support. A number of projects have been financed on the basis of completion guarantees which cover a fixed period for the guarantee. The sponsors may, for instance, agree to service debt for a maximum period of say two years following the first scheduled repayment date. A number of transactions have been completed on the basis of capped guarantees whereby the sponsors agree to guarantee debt service up to a maximum amount. Other variations on the full scope completion guarantee focus on providing limited guarantee cover. The sponsors may, for instance, agree to cover cost overruns only. There are projects which have been financed with minimal sponsor support, the lenders having been prepared to accept the risk of delays and cost overruns. The structuring of these financings inevitably involves a significant degree of lender involvement in the pre-completion period and a much stricter lender control regime. There are an almost unlimited variety of different completion support structures and the final negotiated position usually requires a tailored approached for each transaction, a full understanding of recent precedents and appropriate professional advice.

17.7.2 Sponsor Support During Operations

Once the project has achieved completion the normal expectation is that the financing becomes completely non-recourse and project lenders look solely to the cashflows generated by the project for the repayment of the loans. There can, however, still be specific project risks which the lenders are not prepared to accept and for which some form of sponsor support is required to achieve bankability.

A common form of support involves the sponsors agreeing to inject funds into the project company to cover cash short-falls due to specific events. In the early stages of certain projects, for instance, sponsors have provided working capital support up to specified maximum monetary amount. This may be to cover a new refinery project whereby the lenders have not been able to accept full refinery margin risk in the early years of the project. The sponsors may also agree to provide financial support in the event that the borrower experiences foreign currency shortages or certain force majeure events occur. In providing this type of support, however, sponsors will want to ensure that their financial liabilities are not unlimited and that the contingent events are very carefully defined. The resulting detailed negotiations on the terms of support can become difficult and protracted.

If a sponsor is also a counterparty to a project contract then support may be provided through favourable contract terms. A sponsor providing feedstock to a petrochemical project, for instance, may agree to favourable payment terms, including payment deferrals and payment subordination. A sponsor acting as product offtaker may agree to guarantee offtake volume through favourable take-or-pay commitments, price support through floor price mechanisms or specific types of hedging arrangement.

Sponsors have also been asked to provide support for specific events that have become unavailable in the commercial insurance market. Government sponsors, in particular, may often take on the role of insurer of last resort for specific risks such as terrorism or war (see Section 13.5.3). This form of government support may be documented in an underlying concession or implementation agreement.

17.7.3 Other Forms of Credit Enhancement

In addition to sponsor support arrangements, project finance structures often include other forms of credit enhancement. One of the most effective methods of reducing credit risk is to maintain cash in reserve as security for the risk. The use of various cash reserve accounts is discussed further in Section 19.4.4. Capital expenditure obligations of a project borrower are often cash collaterised by building up cash reserves over a period of time. Maintenance costs and decommissioning liabilities are examples of the types of future capital obligations which commonly require cash security. Third party guarantees and letters of credit are also commonly used to enhance project finance credit obligations. If, for instance, the credit-worthiness of a particular contract counterparty is considered weak then bank letters of credit may be required to back-stop monetary liabilities. Minimum credit rating criteria will typically be applied to any relevant counterparty and the exact form of the support will usually need to be carefully negotiated to ensure that the financial obligations are satisfactory.

17.8 SECURITY

Project finance that is made available to fund projects in the petroleum industry takes the form of secured loans and the importance of the lenders security package has already been highlighted in Section 2.4. Project lenders are providing a significant proportion of funds to an identifiable project and they will thus naturally want to ensure, in the event of difficulties, they are able to exercise their control and ownership rights in the project assets in priority to other claims. Creating security interests in the project assets allows the lenders to effectively exercise these rights pursuant to the loan agreement between the lenders and the borrower. A typical security package for an oil and gas project financing will usually include the following:

- *Land and physical assets*: Lenders will expect to take full security interests in the property of the project company. The ability of lenders to take an effective security interest and to enforce security, if necessary, will, however, be subject to the local laws applicable where the project is located.
- *Contractual rights*: Lenders will usually expect to benefit from the assignment of the rights pursuant to the major project contracts. These rights will include the monetary amounts, particularly the rights to any receivables due from contract counterparties. Clearly there could be significant value in these security rights and lenders will hence careful assess the adequacy of their interests in the project contracts. The ability to take security over contract rights varies between jurisdictions but certain common formalities are usually required particularly notification to, acknowledgement from and consent of the relevant contract counterparties. Host government contracts, including concession agreements and production-sharing agreements can create some challenges in this regard and it is often not possible to obtain meaningful security rights in these types of quasi-public contracts.
- *Account balances and insurance policies*: Project lenders will usually take security interests in the project company's bank account balances and insurance and reinsurance policies. Creating effective security rights over bank accounts and bank balances can present challenges and input from legal advisors will usually be required to ensure that the security interests are satisfactory. Insurance and reinsurance policies will be assigned by way of security to the lender. Again, creating effective security interests in certain

policies can be problematic. Specialist insurers may not, for instance, be prepared to recognise lenders' rights in certain policies.

- *Project company shares*: By taking a security interest in the shares of the project company lenders should, in theory, be able to take over ownership in the project company if they enforce their security interests. Lenders will, therefore, seek to ensure that they have effective security interests in the project company shares. In practice, however, perfecting and enforcing this security may be problematic and the consequences of taking a security interest will need to be fully understood (including, for instance, lenders becoming exposed to additional liabilities pursuant to relevant company and corporate laws).

The security is usually held on behalf of the lender group by a security trustee, typically a dedicated unit or team of one of the commercial banks in the syndicate. The use of a security trustee is particularly important for syndicated project finance loans as the trustee structure allows the composition of the syndicate to be altered without impacting the underlying security structure. The security trustee will be appointed by the lenders and will carry out a number of specified duties, including holding the security interests on behalf of the lenders and dealing with the secured interests on instruction of the lending group (usually following a decision to enforce security).[12] Given that security for oil and gas project finance transactions is usually located in a number of different jurisdictions, there may be a requirement to appoint more than one security trustee. Furthermore, in certain jurisdictions, the concept of a trustee is not recognised resulting in the need to adopt alternative structures to hold the lenders security interests. A common arrangement involves one of the lenders holding the security and being owed the full amount of outstanding debt by the borrower. The borrower also owes an equivalent debt obligation in parallel. This arrangement is known as a 'parallel debt structure' and has been widely used in Russian project finance transactions.

Taking an effective security structure in the borrowers' assets can be challenging for a variety of other reasons. A common impediment to security taking in developing countries is the difficulty in taking security over state-owned assets that are subject to a World Bank negative pledge. If state assets are subject to such a negative pledge then project finance lenders will not be able to take effective security interests in those assets. This has, in fact, presented significant challenges to project financing in a number of jurisdictions.

Overall, therefore, ensuring an effective and bankable security package is created for the lenders can be an onerous, expensive and time-consuming task and project sponsors should not under-estimate the work involved in developing lenders' security interests in project finance transactions.

12. The exact scope of the security trustee's duties will need to be carefully agreed. It has been suggested, for instance, that a security trustee is obliged to perform monitoring duties to ensure that the underlying project assets are being properly maintained, insured and so on. Given the scope and complexity of project finance security packages, this could clearly be a burdensome and time-consuming scope of work for the appointed security trustee.

Chapter 18

Finance Structures for Upstream, Midstream and Downstream Projects

Chapter Outline

18.1 INTRODUCTION

Having looked at the general principles of structuring oil and gas project finance transactions, this chapter will apply these principles to projects in the upstream, midstream and downstream sectors of the industry. Although there is significant variation in the risk profiles and cashflow structures of projects throughout the oil and gas industry, the following sections will demonstrate that project finance structures are sufficiently adaptable to handle this variability.

Section 18.2 looks at the types of structure commonly encountered in the upstream project finance sector. The challenge in the upstream sector is to match the volatile and depleting nature of project cashflows to debt repayment profiles. Various structural methods to manage upstream risks will be examined, including the use of the borrowing base structure for single and multiple field projects. The specific characteristics of upstream LNG projects will also be covered. These projects typically generate longer-term and more stable cashflows resulting in a number of unique structural features that are commonly encountered in LNG project finance transactions.

Section 18.3 then covers project finance for the midstream industry. Midstream oil and gas projects share many characteristics with infrastructure projects in other industries. The project finance structures for this sector of the petroleum industry reflect the utility types economic characteristics of midstream projects and the risks associated with anti-monopoly regulation and political interference.

Section 18.4 examines downstream project finance for refinery and petrochemical projects. The focus in this sector of the petroleum industry is on areas that impact project profitability, particularly project competitiveness, market and supply risks. Additional challenges associated with the overall macroeconomic environment within which a project is operating are also considered.

Finally Section 18.5 will explain the use of various types of derivative contract in risk management for project finance transaction. Although the focus will be directed towards interest rate risk management and interest rate swaps for project finance, the role of commodity price hedging will also be examined.

18.2 UPSTREAM PROJECT FINANCE STRUCTURES

We have seen in Chapter 6 that upstream oil and gas development projects involve a variety of complex risks and unique commercial and contractual structures. Project risks in this sector of the petroleum industry can severely test the risk appetite of the lenders. The petroleum geology underpinning upstream oil and gas projects is vital to the project viability and, at the same time, often extremely difficult to properly evaluate. Unforeseen geological risks will at best increase project costs and at worst result in project abandonment. In addition, upstream projects are often located in physically, politically and economically challenging environments. The structures for upstream oil and gas projects thus vary quite considerably depending on the specific risks to which lenders are exposed.

18.2.1 Lender Risk Analysis

The following sections will take a more detailed look at the approach that lenders commonly adopt to the upstream project risks.

- *Reserves and geological risks*: Estimates of the in-place volumes of sub-surface oil and gas accumulations and the ability to recover these volumes are inherently uncertain. Lenders have traditionally adopted a particularly cautious approach to sub-surface risk and have only considered loans based on the most conservative proven reserves estimates. Furthermore, lenders have shown limited appetite for upstream project development risk. The starting position when considering lender risk appetite for upstream projects is thus to assume that loans will only be available for reserves categorised as proved, developed and producing. Certain risk mitigation structures have been developed which have allowed lenders to take a more open-mined view of reserves and geological risk. In particular, lenders have accepted the concept of portfolio diversification which underpins many of the successfully financed borrowing base facilities. The borrowing base structure will be examined further in Section 18.2.4. In addition, in common with other project finance sectors, lenders have been willing to take a degree of undeveloped reserves risk if robust sponsors are able to provide an element of completion support. In some financings, therefore, lenders have moved away to a significant extent from the traditional proved, developed, producing starting point although, as always, lender risk appetite for any particular project will depend on specific circumstances.
- *Price and market risks*: The oil and gas markets are well known for the volatility of the underlying product prices. Forecasting prices, even in the very short term, is fraught with difficultly. As a result, and in common with sub-surface risks, lenders generally take a cautious approach to oil and gas price forecasting. In the early years of a project, lenders will typically discount published forward prices and then for the remaining years assume a medium term real price forecast. This medium term price forecast is usually maintained at a constant level and inflated to derive a money-of-the-day price forecast for use in the base case model.[1] Forecast oil prices will also need to include assumptions regarding price differentials to account for quality, location or other factors. Lenders normally expect any premiums or discounts to benchmark prices to be independently verified. Forecast gas prices are often ultimately derived from underlying benchmark oil prices, particularly if the gas sales contracts include pricing formulae which make reference to crude oil benchmark indices. If gas is being sold into a market for which a gas benchmark price exists then lenders will want to ensure that the benchmark is reliable for the purposes of long-term forecasting. In the United States, for instance, the Henry Hub pricing point is often used as a benchmark for setting gas prices and lenders have accepted Henry Hub as a basis for gas price forecasting. In addition to the due diligence work which will be undertaken on price benchmarks, forecasts, premiums and discounts, lenders will also

1. As noted in Section 15.2, lenders will usually maintain their own oil price forecasts. These forecasts are commonly referred to as “price decks”.

require an assessment of the break-even price level for particular projects. A break-even price in the context of an upstream project financing is the lowest level to which a particular price can fall in a particular debt service period without threatening the ability of the cashflows to service debt. Break-even price analysis has been discussed previously in Section 16.6.2.
- *Development risks*: We have already seen that lenders have traditionally approached upstream development risks with extreme caution. The particular issues and risks associated with upstream project development have been examined in Part II and will not be covered in any further detail. It is, however, worth re-emphasising that without a robust, single point development contract with an experienced and credit-worthy contractor lenders are unlikely to accept completion risks without some form of contingent sponsor support.
- *Political risk*: If an upstream project is located in politically challenging jurisdictions then the ability to raise project finance may be severely constrained or, in some cases, impossible. Given that upstream oil and gas projects are often subject to a high level of government interference, project finance lenders will want to ensure that political risks are minimised as far as possible by working closely with the government and local partners and often working alongside multi-lateral institutions. Project sponsors seeking to raise project finance for upstream oil and gas projects in difficult locations should not underestimate the additional challenges which result from the high levels of political risk.

It is rarely possible to fully transfer the aforementioned risks to third parties through commercial contracts and lenders will thus need to carefully assess the impact of these risks on the cashflows of the project in order to determine an acceptable financing structure.

18.2.2 Lenders' Base Case for Upstream Projects

The base case cashflow forecasts for upstream projects will need to incorporate detailed assumptions concerning the physical and commercial characteristics of the project. Given the diverse range of upstream projects, it is difficult to generalise cashflow forecasting in this sector of the industry. The nature of the base case forecasts will depend to a significant extent on characteristics of the particular project, whether oil, gas, LNG, onshore, offshore or some other type of upstream development project.

Base Case Revenue Assumptions

Upstream project revenues are a function of overall field production volumes and the prices for the various products sold. For oil production, the volume assumptions are normally derived directly from the independently verified proven recoverable reserves and production profiles. Although proven reserves are equally important for gas projects, the volumes sold pursuant to acceptable sales contracts will also be an important driver of the base case assumptions. The lenders may, for instance, insist that certain categories of gas sales are excluded from base case volumes.[2] Whether a project is based on oil or gas production, the cashflow forecasts will normally need to accommodate phased project development. The assumptions regarding the timing of capital expenditure, phased increases in production volumes and the various tranches of financing will need to be carefully incorporated into the base case assumptions. Lenders will also need to agree the base case forecast of oil and gas prices. The approach, which lenders usually take to forecasting prices, has been covered in the previous section.

Base Case Cost Assumptions

The base case operating and capital cost assumptions will usually be derived from the project sponsors' FDP and verified by the lenders' technical consultant. Upstream projects cost forecasts can, however, present specific challenges to project sponsors and lenders. We have already seen that lenders normally base their lending decisions on proven reserves and production profiles. On the other hand, project sponsors' development plans are more likely to be based on proven and probable reserves. The question then arises as to how to deal with the mismatch between revenues based on the more conservative proven reserves and costs based on the sponsors' proven and probable assumptions. The costs associated with proven and probable assumptions can be significantly higher and hence the project economics will be negatively impacted by this mismatch. In many cases the cost differences may not be material and lenders will be able to adjust their coverage ratio expectations on the understanding that the cost assumptions are probably overly conservative. Project sponsors should, however, understand that the use of proven and probable cost assumptions for the base case forecasts can be a difficult issue to resolve.

A further important consideration when assessing the forecast cost assumptions for upstream projects is the likelihood that significant ongoing capital expenditure will be required throughout the life of the project. Ongoing reservoir management normally involves work-overs of existing wells, the drilling of new production wells and, as the reserves are depleted, potentially costs related to surface facility debottlenecking or enhancements. In addition, project sponsors may want to undertake ongoing appraisal activities and even exploration work for additional resources. Finally the assumptions regarding decommissioning costs towards the end of the project life will need to be carefully considered. Although for new projects these costs are likely to be incurred after the repayment of project finance loans, the requirement to fund decommissioning costs upfront can impact early period cashflows and will need to be included in the base case forecast cost assumptions.

2. Short term gas sales contracts and those made to financially weaker buyers are often excluded from base case revenue assumptions.

Tax and Government Take

The tax treatment of upstream projects can be especially complex, particularly if the project is being developed pursuant to a production-sharing contract and is subject to royalties, cost recovery and corporate tax regimes. The various cost recovery mechanisms, profit sharing arrangements and royalty deductions will need to be properly reflected in the project forecasts. In particular, the eligibility of various operating and capital costs for cost recovery and tax deductibility will need to be verified. In addition to corporate taxes, upstream oil and gas projects are almost always subject to special taxes (see Section 13.4). Overall, given the high incidence of tax on upstream operations and the significant impact which taxes can have on the viability of a project, special attention will have to be paid to the tax assumptions in the base case financial model.

18.2.3 Project Finance Structures

Project finance structures for upstream oil and gas projects reflect the wide variety of different risks, corporate structures, contractual arrangements and underlying project economics. Given the varying characteristics of the underlying projects it is difficult to define a typical upstream project financing structure. The following sections will, however, describe some of the most significant factors which influence the financing structures commonly found in the upstream oil and gas industry.

Debt Capacity

The volatility of oil and gas prices and the high level of geological risk will usually result in project lenders requiring substantial equity commitments from the project sponsors. Although the level of equity commitment required will depend on the specific characteristics of the project, the ability of project cashflows to incur high levels of debt is influenced to a significant extent by the forecast price assumptions. Higher base case oil and gas price assumptions will, for instance, usually greatly increase the debt capacity of a project and, in general, upstream oil and gas projects can achieve higher debt gearing levels in high prices environments. In addition to absolute price levels, however, volatility in prices can also impact project debt levels. In an environment of high price volatility lenders will expect higher debt coverage ratios. In order to reduce the uncertainty in price forecasts, project sponsors may enter into derivative contracts and, in so doing, increase the debt capacity of the project cashflows. Derivative contracts can, however, expose the project to significant financial exposures if production is disrupted. The use of derivative contracts for oil and gas price hedging is explored later in Section 18.5.

Other factors also have a strong influence on upstream debt capacity. The level of government take through the tax system, royalties, production sharing and so on will directly impact the free cashflows available to service debt and hence the ability of these cashflows to service debt. The characteristics of the reservoir and produced fluids can also have a material impact on project debt levels. Natural gas projects that involve the co-production of valuable condensates normally generate higher levels of cashflow compared to project that produce dry gas only. The additional cashflows from condensate sales allow higher levels of debt to be incurred.

Drawdown, Repayment and Debt Tenors

Upstream project capital investment is often phased. There may be an early stage initial project that is designed to produce initial cashflows at minimal cost followed by full stage development later on. Debt may also be phased and the availability of the various tranches is often linked to the staged development of the project. Debt phasing for project finance transactions will usually involve additional structural complexities. There may, for instance, be several different tranches of debt requiring careful coordination of drawdown through intercreditor arrangements.

Repayment structures for upstream oil and gas projects will generally need to accommodate the depletion of the resource base, which in some cases can be rapid. It is thus necessary to ensure that the outstanding amount of debt is suitable given the production profile and the volume of reserves remaining. Production profiles in upstream projects show significant variation and, as a result, repayment profiles tend to vary greatly between different projects. For a rapidly declining profile with peak production lasting not more than a few years, the cashflow available for debt service is largest at the beginning and then declines as the production declines. To achieve a constant debt service cover ratio in each period of the loan means that the total debt service in each period also needs to decline and hence the debt principal repayments need to be heavily front loaded. A small oil field with rapid depletion would typically generate this type of structure. In contrast large gas fields may produce at peak plateau rates for much longer periods and are thus able to accommodate more constant repayment profiles.

The rate of depletion of the underlying hydrocarbon resource will also have a strong influence on the tenor of the loan facility. The proportion of the original base case reserves that remain to be produced (known as the 'reserve tail') is an important factor in determining the final maturity date of a reserve based loan facility. Lenders will typically expect full repayment of debt with at least 20 to 25% of the reserves remaining to be produced and, assuming no other constraints on tenor, this reserve tail ratio will ultimately determine the final maturity date of the loan.

Lender Controls

Lenders to upstream projects will expect to exercise the usual business, cashflow and financial controls over the activities of the project company. The nature of upstream development projects can, however, create a number of significant challenges to lenders when attempting to exercise their control rights over upstream borrowers. Firstly, the management and development of oil and gas reservoirs typically extends throughout the life of the project. Reservoirs are produced in a highly dynamic environment and, as the subsurface conditions are understood, changes may need to be made to the original development plans. Furthermore, drilling activities often continue throughout the field life and additional opportunities to develop the underlying resources may become apparent as time moves on. It is difficult under these circumstances for lenders to judge the correct level of control over reservoir management activities.

Secondly, the nature of the joint operating arrangements can also make traditional project finance control mechanisms over the borrower's activities more difficult to implement. As we have seen previously, the mechanisms for agreeing budgets and cash calling are determined pursuant to a joint operating agreement. These mechanisms typically allow the operator significant flexibility and often dilute the ability of the lenders to influence decision-making. In addition, many important contracts, including insurance contracts, are often entered into directly with the operator rather than the borrower.

The traditional lender controls over project borrowers are thus often difficult to achieve for common unincorporated joint venture upstream developments. Project lenders will therefore need to assess the overall risks to which they are exposed, including the competency of the operator and the risks associated with the underlying development. Even if significant control rights can be put in place, lenders are often in a poor position to direct detailed project decisions, particularly during the development phase. Given the very high levels of uncertainty, particularly as a result of limited sub-surface data in the early phases projects, flexibility in approach is often required. Incorrect decision-making could result in significant difficulties and under-performance of the reservoir.

Sponsor Support and Credit Enhancement

Given the diverse range of risks that can impact upstream cashflows, sponsor support is often required to ensure that project risks are acceptable to lenders. We have already seen that upstream project completion risks are usually high, particularly for offshore projects and projects located in harsh or undeveloped environments. Project sponsors are thus often required to provide completion support or completion guarantees. Depending on the particular circumstances and characteristics of a project, lenders are often unwilling to accept certain other specific risks. Sponsors may be required to provide a level of contingent funding throughout the life of the project to cover specific risks. Sponsor contingent funding has, for example, been used to provide a degree of mitigation for security risks or the risk of political violence in a number of projects. The nature and amount of contingent support will usually be the subject of significant negotiation and will depend on the magnitude of the risk and the likelihood of a particular event occurring. In addition to financial support, project sponsors will also usually be expected to provide a significant element of project management, operational and technical support through operating agreements, service agreements, secondment of key staff to manage project operations and so on.

In terms of credit enhancement, lenders will often require letters of credit or other forms of enhancement for offtakers of crude or natural gas. Government offtakers of natural gas in undeveloped markets may, in particular, require credit enhancement. In several African jurisdictions, for instance, the World Bank has provided credit support for national companies which are offtakers.

18.2.4 Borrowing Base Facilities and Reserve Based Lending

A borrowing base is a financing concept whereby funding is raised on the basis of the valuation of a single asset or portfolio of assets.[3] When applied to upstream oil and gas projects, a borrowing base financing represents a commitment from lenders to advance funds based on the value of a borrower's oil and gas assets. This financing technique is highly flexible and has become popular with borrowers seeking to raise funds for upstream oil and gas projects in a variety of different locations. The method of valuing the oil and gas reserves is pre-determined in the loan agreement and the debt structure is based on the evolution of the valuation of the assets over the life of the facility.

Single Field Borrowing Base Structure

For a single field, the calculation of the borrowing base amount involves discounting the project cashflows over the loan life or project life and calculating the NPV of the production. The loan life or project life cover ratio is then applied to the calculated net present value. Table 18.1 illustrates the borrowing base calculation for a hypothetical oil field.

TABLE 18.1 Illustrative Borrowing Base Calculation

Assumptions		
a	Loan life NPV	US$ 1,000 million
b	Project life NPV	US$ 1,500 million
c	LLCR	1.3
d	PLCR	1.5
Borrowing base amount		
a÷c	Loan life basis	US$ 769 million
b÷d	Project life basis	US$ 1,000 million

3. Borrowing base financing techniques can in theory be applied to any type of asset. Current asset financing (inventory and receivables) as well as commodities and other various types of raw material have been financed using borrowing base techniques.

This example shows that the project life NPV is greater than the loan life NPV due to the longer time period over which net cashflows are included in the calculation. A lower coverage ratio is, however, applied to the loan life ratio in recognition of the lower risks associated with the shorter loan life period. The lower calculated borrowing base of US$ 769 million is used to determine the maximum borrowing capacity.

The cashflow assumptions will be agreed with the lenders and will cover relevant oil and gas prices, capital costs, operating costs, taxes and so on. The underlying loan is usually structured as a revolving credit facility and the borrowing base calculation determines the maximum amount the loan that is available for drawing. The borrowing base amount is re-calculated on a regular basis throughout the term of the loan by updating the financial model assumptions, the cashflows and ultimately the net present value. This exercise is known as a 'redetermination' and usually takes place every six months. The detailed procedures for redetermining the borrowing base are set-out in the loan agreement and usually involve one or more of the banks in the syndicate working with the borrower to produce revised cashflows with updated technical and economic assumptions.[4] The revised borrowing base amount is used to determine the maximum loan amount that is permitted to be outstanding following the determination exercise. If the actual amount outstanding under the loan facility is greater than the maximum permitted amount then the borrower is obliged to reduce the facility by repaying an amount sufficient to restore the borrowing base to its maximum level.

The redetermination exercise and resizing of the borrowing base can create a number of difficulties. Firstly, any reduction in the production profile of the underlying reserves will reduce the amount of the borrowing base. The borrower is thus likely to be required to reduce its debt obligations just at the time when the volumes of production are falling and hence revenues are likely to be under pressure. Secondly, falling oil or gas prices are also likely to reduce the borrowing base and require debt reduction. Again the borrower will be making higher debt service payments at the same time as cashflows are being put under pressure. Finally, increases in operating and capital costs will likewise both reduce cashflows and impact the borrowing base amount. When entering into agreements with lenders based on borrowing base structures, upstream project borrowers will thus need to carefully assess the consequences of changes to the underlying project cashflow assumptions and the ability of the project to withstand negative cashflow impacts.

Multiple Field Borrowing Base Structures

In addition to single field projects, the borrowing base concept is now commonly applied to portfolios of upstream assets. Apart from the need to consider multiple

4. The bank mandated to manage the redetermination process is typically referred to as the Technical Bank. Sometimes a separate Modelling Bank may also be appointed to manage the modelling function alongside the Technical Bank. More than one bank may be mandated to perform these roles.

NPVs (usually by simply adding the values together), the procedure for calculating the borrowing base for a collection of upstream assets is no different to that described for single fields. The borrowing base calculations are used for a wide range of fields that may vary significantly in terms of geographical spread, type of field and commercial structure. The ability to include an asset within the borrowing base portfolio will depend on the fulfilment of a set of criteria agreed with the lenders. Lenders are prepared to accept a greater element of risk in the portfolio given that risks are spread through a pool range of independent assets. The criteria for inclusion in the pool typically cover the following field characteristics:

- *Certainty of reserves*: Usually P90 for fields which are yet to start production and P50 for producing fields.
- *Field development status*: A limit will usually be placed on the proportion of fields in portfolio that are not producing.
- *Geographical concentration*: A limit is usually placed on the location of assets. A maximum proportion of assets in emerging market locations may, for instance, be included.
- *Gas production versus and oil production*: There may be limits on the proportion of gas producing assets in the portfolio.

The borrower is normally permitted to bring eligible new assets into the portfolio provided these assets meet pre-agreed criteria, which will typically cover the aforementioned characteristics and are intended to preserve the quality of the underlying borrowing base portfolio.

The financing structure will also include lender controls over the cashflows of the project that are similar to those for other types of project finance. The reduction of risk due to the pooling of assets has however tended to result in a weakening of a number of project finance features in borrowing base type facilities. Given the predominance of producing assets in the borrowing base pool, access to existing cashflows and limits on development risk, multiple field borrowing base facilities have more corporate loan features, including, for instance, corporate style financial covenants.

18.2.5 Upstream LNG Projects

We have seen in Chapter 10 that the LNG industry has certain distinguishing characteristics, including a unique and integrated supply chain, high levels of national interest, government-to-government relationships and long-term offtake arrangements. Project finance has been applied to projects in all elements of the LNG the value chain, including upstream field development, liquefaction, shipping and regasification. The financing of the field development element of the LNG value chain shares many features with other upstream projects. In addition, the liquefaction component of an LNG project is also often financed as part of the upstream financing. Upstream LNG project finance thus usually involves financing of the development of the gas field through to the sale of the liquefied gas. The cashflows generated by the project will be based on the revenues generated pursuant to long-term LNG sales contracts plus the sale of any associated petroleum streams including LPGs, condensate and sulphur.

Lender Risk Analysis of LNG Projects

Lender risk analysis for LNG project finance will, like other upstream projects, focus on the sufficiency of the reserves, project completion, price and offtake, shipping risks[5] and so on. A particular focus of the lenders will be on the market and marketing arrangements for the regasified LNG. Lenders will want assurance that the final destination for the gas will sustain the level of production from the project and that the offtakers of the LNG have sufficient experience and necessary capabilities to access the destination markets. In contrast to many upstream oil projects, therefore, the lenders will expect to undertake a significant level of due diligence on the arrangements for offtaking and marketing the final products.

LNG projects are often located in difficult jurisdictions and lenders to these projects can be exposed to a significant degree of political risk. Some of the more difficult locations for LNG projects have included Yemen, Papua New Guinea and Nigeria. The level of political risk is not only a lender concern but also presents challenges to project sponsors given that the lenders' country limits can be highly constrained. As a result, it is generally necessary for sponsors to base their funding plans on a significant element of export credit agency cover and other forms of credit risk mitigation.

Given the size and extent of most LNG projects, environmental impacts and environment risks are often an important feature of LNG project finance. Environmental and social issues can be the most important determinants of the viability of an LNG project financing. There are several precedent project finance transactions for LNG projects that have been strongly impacted by environmental issues and sponsors should not underestimate the amount of time and effort that needs to be dedicated to the environmental aspects of LNG project financing.

LNG Project Cashflows

We have seen earlier that upstream project finance cashflows are usually characterised by the depletion of the reserves and declining production profiles during the loan repayment period. In contrast, however, LNG project cashflows tend to be long term and relatively stable. The financial structuring of LNG projects is, as a result, usually characterised by constant debt service coverage ratio and full payout loan repayment profiles. An important issue when considering the forecast

5. The shipping risks associated with LNG projects have traditionally been a significant focus area of project lenders. Satisfactory LNG shipping arrangements are vitally important to the success of an LNG project and the commercial and financial arrangements for shipping can, in themselves, be complex and risky.

cashflows of LNG projects is the contribution to project revenues made by non-LNG revenues, particularly from the sale of condensates and LPGs. These components of LNG projects can yield significant additional revenues but will usually be much more closely correlated to global oil prices. In addition, the production profiles of condensates and LPGs can vary significantly over the life of the project. The sensitivity of the project to changes in the production or price of condensates or LPG needs to be considered when structuring the financing for an LNG project.

Finance Structures for Upstream LNG Projects

A variety of corporate and financial structures have been adopted for upstream LNG projects. A fully integrated project involves the development of the gas reserves and gas liquefaction as a single project. Many LNG projects have been financed on this basis. Alternatively the gas supply component of the project can be separated from the gas liquefaction component. In this case the commercial arrangements will normally involve the liquefaction company purchasing gas feedstock pursuant to a gas supply agreement and selling the liquefied LNG to long-term offtakers pursuant to LNG sales and purchase agreements.[6] The gas resource owners or LNG buyers may also toll the gas through the liquefaction project. Furthermore, the upstream component of an LNG project may or may not involve the procurement of required for ships depending on the commercial arrangements for the sale and purchase of the LNG.

Whatever structure is adopted to implement a project, the long-term and capital-intensive nature of the LNG industry results in a variety of common project finance structural features.

- *High debt capacity*: With strong long-term purchase contracts, credit-worthy offtakers and acceptable levels of debt coverage, LNG projects have usually been able to raise significant proportions of debt.
- *Complex debt composition*: The large size of the debt funding requirement typically results in the need to source debt from a variety of different institutions. Debt structures for upstream LNG projects are thus normally multi-sourced with associated complex intercreditor arrangements.
- *Long tenors*: Stable cashflows, long-term gas production profiles and contracted offtake typically translates into extended debt tenors often exceeding fifteen years.
- *High level of lender control*: Project cashflows are typically controlled on the basis of offshore US dollar accounts and comprehensive cashflow waterfalls. Lenders will also expect to exert significant control over the borrowers

6. The contractual arrangements concerning gas supply and LNG offtake will need to be very carefully structured to ensure that the project company is not left with risks that cannot be managed and mitigated. Ensuring that the contractual force majeure provisions are consistent amongst the various contracts is particularly important in the context of project finance risk analysis and bankability for this type of project structure.

business activities, especially the major project contracts, constraints on expansions and restrictions on shareholder transfers.

- *Sponsor support and credit enhancement*: Almost without exception upstream LNG project finance transactions have included strong completion support from the project sponsors in the form of completion guarantees and complex lender reliability testing regimes. Other forms of sponsors support and credit enhancement may be required in certain circumstances particularly if the financial standing of offtakers is questionable or specific project risks are unacceptable to the lenders.

Overall, however, it is important to understand that the upstream financing of major LNG projects cannot be isolated from the rest of the supply chain. Shipping, regasification and gas marketing can also have a significant impact on the financial structures for upstream LNG projects, particularly given that debt is likely to be raised for these related elements of the LNG chain.

18.3 MIDSTREAM PROJECT FINANCE STRUCTURES

Project finance structures for midstream projects reflect the long-term nature of the projects, the high capital intensity of this segment of the industry and the generation of cashflows from the forward sale of capacity. A wide range of corporate structures are commonly encountered in midstream projects reflecting the variety of ways that ownership, operation and capacity usage can be divided between buyers, sellers and investors. Corporate structures will typically have a significant influence on the commercial, contractual and financial structures in any particular project.

18.3.1 Lender Risk Analysis

Midstream industry risks, commercial structures and contracts have been discussed in Part II, with a particular focus on the contractual basis for midstream revenues, the importance of the legal and regulatory regime and the environmental and social impacts of projects in this sector of the oil and gas industry. Lenders will, therefore, focus attention on these areas during the project due diligence phase.

- *Capacity usage*: The commercial structures for the midstream industry are based on the forward sale of capacity, including pipeline transportation capacity, storage capacity or shipping capacity. The contracting counterparties and contractual basis for the sale of capacity will be examined in detail by the lenders. Without revenues from the underlying commercial contracts the project will usually struggle to service debt and lenders will thus want assurance that the contractual structure is acceptable. Long-term capacity usage contracts typically generate long-term stable cashflows and hence, if the contracts are acceptable to lenders (including satisfactory credit standing of the contract counterparties), midstream project cashflows should be an attractive source of debt service for long-term lending.

- *Project development*: Although the technical uncertainties and risks in the mid-stream are generally viewed by lenders as being lower compared to upstream, refining and petrochemicals projects, lenders will still want assurance that completion risks are adequately mitigated. In addition, technical risks can be high, especially for offshore projects (including, for instance, pipeline projects in hostile environments), sub-surface gas storage projects and so on. The contracting arrangements for large midstream infrastructure projects can be complex with multiple interfaces and logistical challenges over wide geographical areas.
- *Political and regulatory*: Political and regulatory issues can represent some of the most significant risks to midstream projects. Lenders will usually expect certainty of revenues pursuant to long-term contracts and will be especially concerned if these arrangements could fall foul of anti-competition laws and third-party access rights. Lenders will usually expect confirmation that the relevant project is fully compliant with all the relevant regulations.
- *Residual values*: Although residual value risk is especially relevant when funds are being used to finance moveable assets such as ships it can be applicable to any infrastructure project which has a life longer than the relevant usage contract, lease or capacity agreement. Before taking residual value risk on a financing, lenders will want to scrutinise the underlying market at the time of exposure and will typically ascribe a conservative valuation to any uncontracted periods in the project life.

In addition to risk analysis on the project itself lenders will want to carefully assess the rationale for the project and the justification for the investment in the infrastructure. Without viable upstream supply and downstream markets infrastructure investment is likely to become stranded and even the strongest commercial contract arrangements will be untenable over the long life of the asset.

18.3.2 Lenders' Base Case for Midstream Projects

Compared to projects in other sectors of the petroleum industry, the base case forecasts for midstream projects can appear relatively straightforward. Revenue assumptions for midstream projects are typically derived by reference to tariff, rental or similar payments made pursuant to long-term contracts

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7. The assumptions regarding long-term regulated tariffs are normally based on the particular regime applicable at the time of financing. The calculations of the applicable tariffs can be complex and may include reference to regulated asset bases, allowable rates of return or cost of capital, allowable operating and capital expenditure and so on. Assumptions regarding the long-term direction of regulated tariffs will also need to be made and, given inherent uncertainty in the tariff calculations, lenders will typically require an independent opinion on the underlying regulated tariff assumptions included in the base case forecasts.

or governing regulatory regimes.[7] Assumptions are also required regarding availability and usage of the particular midstream assets. Although the tariff payment calculations may be complex and will often need to accommodate detailed timing and payment assumptions, in contrast to the volatility in upstream and downstream projects, infrastructure cashflows are generally assumed to be relatively stable and predictable.

Further complexity in the base case model calculations is often required for cross-border pipelines with multiple borrowers in the different jurisdictions. Lenders will want to ensure that the cashflows' forecasts reflect the legal, accounting, tax and commercial structures in the various different jurisdictions. The financial model may need to accommodate a number of separate corporate entities each with its own cashflow waterfall. Consolidated cashflow statements incorporating overall project debt cover ratios will also typically be required. The specific modelling requirements and complexity of the calculations will depend on the particular characteristics of the project structure.

18.3.3 Project Finance Structures

Project finance is widely used to fund oil and gas infrastructure projects, including pipelines, storage facilities, ships, FPSOs and drilling rigs. The financing structures for these projects depend to a large extent on the terms of the infrastructure usage contracts and credit worthiness of the contract counterparties.

Debt Capacity

The debt capacity for midstream projects is largely a function of the quality of the underlying usage contracts. If the project has a strong underlying contract then debt levels of 80% or higher may be possible. In addition, if the cashflows from the contracts are expected to be stable then lenders will generally accept a much lower level of debt coverage compared to other projects. Debt service cover ratios of as low as 1.2:1 have been known in the midstream sector compared to 1.5 to 2.0:1 in the upstream and downstream sectors. Infrastructure projects in the oil and gas sector are therefore usually characterised by high levels of debt. The stability of the oil and gas infrastructure cashflows could make bond issuance a feasible funding option. Indeed there are examples of shipping, pipeline and other infrastructure projects which have been successfully rated and raised capital markets funding.

Repayment and Debt Tenors

The availability and drawdown conditions for infrastructure loans are similar to project finance transactions in other sectors and reflect the payment milestones pursuant to the underlying development contracts. The general terms of shipbuilding contracts were examined in Chapter 9. The payment terms of shipbuilding contracts are relatively standard and will determine the drawdown of funds for the purposes for funding newbuild vessels.

In contrast to the repayment structures commonly found in the upstream industry, infrastructure projects usually include relatively constant repayment profiles reflecting the stability of the cashflow profiles for these types of contract. Furthermore, infrastructure projects are usually long-life and hence the cashflows can accommodate long tenor debt. Loan tenors of up to twenty years may be possible if the project is supported by strong usage contracts and a predictable legal and regulatory environment. It is often found, however, that other constraints determine the debt tenor, including the location of the project or the nature of the project to which the infrastructure relates. The tenor of a loan for an FPSO chartered for an oil field will be determined by the expected production profile of the reservoir.

Moveable assets such as ships and rigs usually have alternative uses and hence have value independent of an individual project. Whilst ships and rigs are usually financed on the basis of specific charter-parties, lenders will often accept a degree of residual value risk.

Lender Controls

Lenders will expect typical project finance control mechanisms for midstream projects, including controls on additional financing, cashflow and business activities. Lender controls over pipeline project, and especially those crossing borders, can be onerous. Given the importance of environmental impact and the legal and regulatory framework, the financing structure of cross-border pipelines is likely to include significant restrictions on the ability of the project company to make decisions in these areas without consulting with the lenders.

We have already seen that permits and approvals for infrastructure projects are critical to the ongoing viability of a project finance transaction in this sector. Lenders will thus expect to carefully control the activities of the project company to ensure that all necessary permits and approvals are obtained as a condition to funding and that the project remains fully compliant throughout the loan life. Changes in the regulatory environment can require material expenditure from project cashflows. In some cases this may threaten the ability of the project company to service debt. Lenders will thus want to assess any potential risks to the project from changes in law and understand how the project will be compensated through tariff increases or other mechanisms if project cashflows are impacted by changes in laws and regulations.[8]

Sponsor Support and Credit Enhancement

As we have seen, the commercial structures and project economics of pipelines, storage and other infrastructure projects are normally based on capacity

8. Lenders will undertake significant due diligence on the underlying concession or implementation arrangements for infrastructure projects. It may be possible to transfer the economic risks resulting from changes to the permitting and approvals regime onto the host government through concession and implementation agreements. This may include mechanisms for financial compensation, contract termination and payment of termination sums and so on.

usage agreements and other contractual arrangements. In contrast to upstream and downstream project finance, sponsor support mechanisms and credit enhancement are thus focused principally on ensuring that long-term revenues are supported by credit-worthy counterparties. Parent company guarantees from project sponsors or third-party letters of credit may be required to ensure that the capacity usage obligations are acceptable to the lenders.

In addition to support and credit enhancement arrangements to underpin the capacity usage, lenders will normally expect the project sponsors to provide completion support. A significant issue that will need to be addressed with regards to completion support concerns the level of risk which the project may be exposed to in any related upstream and downstream projects. A gas pipeline project may, for instance, be dependent on the completion on the development of a particular upstream gas development project together with any downstream infrastructure to deliver the gas to end-user markets. Lenders will usually expect the completion support arrangements to mitigate the risks associated with the upstream delivery of gas into the pipeline and the availability of downstream capacity such as interconnecting pipelines or processing plant. The scope of the completion tests could thus extend beyond the project being financed into the performance of projects which may have different sponsorship. The negotiation of the exact scope of completion testing when lenders are confronted with project-on-project risk of this nature can be difficult and protracted.

18.4 DOWNSTREAM PROJECT FINANCE STRUCTURES

The refining and petrochemical industries both involve the processing of large volumes of raw material feedstock into finished products for use in a variety of end-consumer markets. Whilst sharing many similar characteristics, there are also important differences between refinery and petrochemical projects. Refineries earn income by the continuous processing of very large volumes of crude oil into final refined products. The gross margins generated by refinery operations are relatively low, often just a few dollars per barrel of crude oil processed. In contrast, petrochemicals projects generate higher margins on lower volumes of more valuable product. These differences influence financing structures in the downstream sector and mean that lenders will look at refining and petrochemicals as different sub-sectors within the overall downstream industry. Whether financing refinery or petrochemicals projects, however, lenders chief concerns will be focused on the cyclical and volatile nature of industry profitability and the difficulties in projecting long-term supply, demand and pricing trends in the relevant target product markets.

18.4.1 Lender Risk Analysis

The principle risks which lenders will focus on during the due diligence process will be the project economics and particularly the viability of the project given the volatile nature of the revenues. Lenders will also want to assess whether completion and technical risks are acceptable to ensure that the project is capable of producing the required product on schedule and within budget.

- *Market risks*: The volatility of refinery margins and the highly cyclical nature of petrochemical prices will usually result in lenders taking a conservative approach to downstream petroleum industry market risks. Independent expert market advice will form an important component of the lenders' due diligence process and considerable analysis will be undertaken on historical supply, demand, prices and margins. The lenders' market consultant will normally provide pricing and margin forecasts for the base case forecast and will also assess the competitive position of the project together with the competency of project sponsors in the targeted product markets. Sensitivity and break-even analysis will also form a vital element of the lenders' risk assessment process.
- *Feedstock and other supplies*: Without a secure supply of feedstock and other essential inputs the bankability of a project will be highly questionable. Lenders will want to assess the physical and commercial arrangements for feedstock sourcing and understand the historical performance of any third-party supplier. Furthermore, lenders want assurance that contingent suppliers are available in the event that feedstock is disrupted. Alternative supplies may be available from other sources or from the project's own feedstock storage. Overall, project lenders and their advisers will scrutinise the terms of the various supply agreements to the project to ensure that the contractual obligations are consistent with the perceived risk to supply of raw materials. If the risks are considered to be especially high then lenders may require a separate due diligence exercise to be undertaken by a third party specialist.
- *Technical risks*: Lenders to downstream projects will want independent confirmation that the technology employed is proven and that the sponsors have the capability and expertise to develop the project using the chosen technology. The lenders will also examine the contractual interfaces between the various construction contracts and technology providers. In general lenders prefer the contractors to 'wrap' the licensed technology and take full responsibility for the technology design basis. Lenders will also want assurance that the operating and plant availability assumptions in the financial model are reasonable given the technology being employed.
- *Competitiveness*: Lenders will expect independent confirmation of the competitive position of the project and the cost of delivering products into the target market compared to other competing plants. Lenders prefer to lend to new projects which can be shown to be cost leaders in the relevant target markets (and this will usually translate into top quartile[9] performance).

9. Measuring performance using quartiles is a common method of determining competiveness. The top quartile is broadly equivalent to the top performing 25% of the particular population being measured.

Lenders will also want to see break-even price assumptions and the ability of the plant to operate in low margin or price environments.

- *Macro-economic*: Refinery projects which import crude oil feedstock and sell product into local markets can be exposed to significant foreign exchange risks. Lenders to such projects will want assurance that the borrower has sufficient foreign exchange available to pay for both the dollar denominated feedstock costs and any foreign currency debt service. Direct agreements with the host government, various sponsor support mechanisms and other protective measures are often needed to ensure that exposure to foreign exchange risks is bankable.

In summary, therefore, the risk analysis and due diligence process for downstream project finance transactions reflect the variable nature of the risks in the industry and can be onerous and time consuming.

18.4.2 Lenders' Base Case for Downstream Projects

The cashflows forecasts for refinery and petrochemical projects are generally complex and require the prediction of a variety of technical, market and macroeconomic assumptions over the life of the project.

Base Case Revenues Assumptions

Refinery and petrochemicals industries produce a wide range of products for sale into local, regional and international markets. In addition, a variety of contractual arrangements are commonly found in the industry which will impact the basis of the revenue calculations in the base case forecasts. It is essential that the base case revenue assumptions reflect the long-term marketing strategy for product sales and any contractual terms with third-party offtakers. The marketing strategy will also dictate the product sales, marketing and distribution costs. The logistics costs associated with product sales into distant markets can often represent a significant proportion of product revenues and it is thus essential to ensure that these costs are correctly treated in the base case revenue assumptions.[10] The price assumptions in the base case forecasts are typically derived from the due diligence undertaken by the lenders' market consultant.

Base Case Operating Costs

The costs of feedstocks typically dominate downstream project costs. The volumes of feedstocks required for the base case production assumptions is related

10. The treatment of sales, marketing and distribution costs in the base case projections is a function of the contractual arrangements between the project and the various offtakers, marketers or distributors. The terms of delivery will, for instance, typically influence the selling price. FOB prices will not normally include delivery costs and hence will be lower than delivered CIF prices. It is thus essential to avoid the exclusion or double counting of logistics costs otherwise projected revenues could be materially under- or over-stated.

to the technical specifications of the project and should be consistent with the design and construction contracts for the project. The price assumptions for feedstocks will usually be derived by reference to long-term feedstock supply agreements. The feedstock prices pursuant to these contracts are often determined according to formulae and these arrangements will need to be accurately reflected in the base case forecasts. Feedstock prices may also be determined in currencies that are not the same as the base case currency of the financial model. An element of currency risk will then be brought into the project which will need to be carefully assessed. In addition to feedstock costs, the base case will need to incorporate assumptions for utilities, catalysts, chemicals, wages and salaries, insurance and so on. These costs can be significant and may be difficult to estimate over long time periods.

Base Case Tax Assumptions

Refinery and petrochemicals projects are typically subject to the general corporate tax regime which apply in the particular jurisdiction where the project is located. Special provisions may apply to projects developed in industrial zones or which are the subject of government implementation agreements or concessions. The base case projections should reflect any applicable special tax provisions and lenders may expect the assumptions to be reviewed by a specialist tax adviser.

18.4.3 Project Financial Structures

Project finance is widely used to finance refinery and petrochemicals projects and has been applied both to greenfield projects and expansions of existing facilities. A variety of structures have developed, the characteristics of which depend on the particular circumstances of the project.

Debt Capacity

The debt capacity of a downstream project will depend on the variability of cashflows which in turn is largely a function of the project's contractual structure. Merchant projects fully exposed to volume and price risks will have a much lower level of debt capacity compared to fully contracted tolling type projects. A number of commercial arrangements have been incorporated into projects which increase project debt capacity. The subordination of payments to feedstock supply payments may, for instance, increase the amount of debt which the project cashflows can accommodate. Despite the apparent attractiveness of feedstock subordination to project economics, lenders will, however, question the willingness of a supplier to continue supplying over extended periods without payment.

Repayment and Debt Tenors

The repayment structures and debt tenors for refinery and petrochemicals projects reflect the variability of the project cashflows. The debt structures for projects fully exposed to volume and price risks will usually have flexibility in the repayment schedule. Target and mandatory repayments, deferral options, cashsweeps and so on are commonly included in petrochemical and refinery transactions. The financing structure may also include mechanisms to ensure that the borrower builds up cash reserves which can be used if cashflows are weak. The tenors of loans to downstream projects are usually shorter reflecting the challenges in forecasting prices and margins over the long-term.

Projects structured on the basis of full volume and price risk mitigation (through a tolling structure, for example) have less volatile cashflows and the repayment and debt tenor will reflect the lower cashflow risks. Although longer debt tenors are usually possible, the credit-worthiness of the contract counterparty will usually act as a constraint.

Lender Controls

Project finance lenders to refinery and petrochemicals projects are especially concerned to ensure that the projects have access both to competitive feedstocks and relevant markets, at least for the duration of the loans. Lenders will hence want assurance that the commercial arrangements for feedstock supply and product offtake are sustainable and preserved. In negotiating the project finance structure, therefore, the lenders will usually expect to control the most important terms of the feedstock supply and product offtake contracts. In addition, lenders will expect to enter into direct agreements with the suppliers and offtakers to ensure that the relevant contractual obligations are maintained. The ability of the project company to alter the terms of the core project contracts or to make important decisions pursuant to the contracts will usually be strictly controlled by the lenders. A detailed list of reserved discretions covering the main contract terms will usually be included in the financing documents.

Lenders will also expect to control the cashflows of the project company through offshore account structures. The buyers of the products will usually be expected to pay into offshore secured accounts from which funds will be disbursed according to standard project finance cash waterfall mechanisms.

Sponsor Support and Credit Enhancement

We have seen already that lenders may not accept certain project risks and that it is not feasible to transfer these risks to other parties through commercial contracts. In these circumstances the project sponsors may be required to provide support to the project or directly to the lenders. Alternatively, the sponsors may be able to arrange other forms of credit enhancement to satisfy lender requirements. In common with upstream and midstream projects, downstream project completion risks are usually too great for lenders to accept without mitigation. Lenders to refinery and petrochemicals projects typically expect completion support from project sponsors and this support usually takes the form of completion guarantees or debt service undertakings. It should be noted, however, that despite the comparatively high levels of completion risk inherent in the industry, a number of downstream project finance transactions have successfully raised debt without sponsor completion support.

For refinery transactions there may also be a requirement for sponsors to provide some form of support in the case of low refinery margins. Financing structures in the refinery sector have included, for instance, working capital support during the operating period up to a specific level. Petrochemical transactions have also included operation period support, specifically through the provision of feedstock deferral and subordination mechanisms. As an example, a project sponsor, perhaps state owned, may supply feedstock to a petrochemical project and as part of the supply arrangements agree to defer payments for feedstock if the project is unable to fund the costs due to insufficient operating cashflow. The sponsor/feedstock supplier in this case effectively takes a subordinated position and the amount deferred is converted to a subordinated loan obligation.

Security

Although lenders will expect to benefit from a full security package there are certain specific issues that need to be considered in relation to the downstream industry, especially refinery projects. The most important issue regarding security concerns the treatment of working capital, particularly amounts due to crude oil feedstock suppliers and the value of raw materials and finished products in inventory. The large volumes and high value of crude oil feedstock and refined products in storage often result in significant working capital valuations. Related to this is the potential trade amounts owed to crude oil suppliers in the normal course of business. Assuming a 200,000-barrel per day refinery which has mandatory storage requirements of 90 days and a US$ 70 per barrel oil price, the value of crude oil in storage would be equivalent to U$ 1.35 billion. Assuming further that the refinery is given 30 days credit by a dedicated crude oil supplier, the supplier would be owed US$ 450 million and will thus represent a material additional short-term debt obligation of the refinery company.

Two issues often need to be considered in relation to the inventory value and the liabilities to suppliers. Firstly, the refiners are often reluctant to include inventory in the security package for the project finance lenders. The argument made being that the inventory can be used as security for shorter term working capital financing. Indeed, many refinery projects include mechanisms to allow the project company to raise working capital finance that is secured against inventory. Secondly, the crude oil supplier will often expect to take a secured position over the crude oil inventory. In this respect, the crude supplier becomes a secured creditor of the project and, in respect of the inventory, takes a priority security interest which is senior to the project lenders. The legal questions that may arise as a result of the different working capital security structures can be difficult to resolve and can dominate inter-creditor negotiations given the importance and value of ongoing feedstock supply and inventory.

18.5 RISK MANAGEMENT AND DERIVATIVE CONTRACTS

A project company can enter into a variety of different types of derivative contract to manage specific cashflow risks, including: interest rate, currency and commodity swaps, various types of option contracts, forward contracts and futures contracts. Although these derivatives contracts can be a potentially flexible and attractive form of risk mitigation they also tend to be complex and, in certain circumstances, they can increase cashflow risks.[11] As a result, project finance lenders will normally want to ensure that the project company's ability to enter into derivatives contracts is carefully controlled.

18.5.1 Hedging Policies and Lender Controls Over Derivatives Contracts

The ability of the project company to enter into derivatives contracts will usually be severely restricted through covenants in the project finance loan agreements. The primary objective of these restrictions is to prevent the project company entering into contracts that could expose the lenders to additional cashflow risks. The borrower and lenders will typically agree an overall policy or strategy for hedging which will cover:

- The maximum and/or minimum notional amounts that the borrower is permitted to hedge. This is usually expressed as a proportion of the outstanding amount of senior debt.
- The types of derivative contract which the borrower is permitted to enter into.
- The broad terms and parameters for entering into derivative contracts. There is, for instance, usually a strict provision in the project finance documentation prohibiting the use of derivative contracts for speculative purposes.
- Minimum financial criteria for hedge counterparties (including minimum credit ratings and so on).
- The method of soliciting bids from, and ultimately selecting, potential hedge counterparties.

In terms of the hedge counterparties, the banks that act as members of the underlying loan syndicate will often also act as the counterparties to derivative contracts. The project sponsors will however want to ensure that they are receiving the most competitive quotes from potential hedge counterparties and

11. Derivatives contracts can involve potentially very large payments between the contract counterparties based on movements in underlying market indices. Unless these payments properly match equal and opposite movements in underlying project cashflows, then project borrowers can become exposed to significant net cash payment obligations to the derivative contract counterparties.

will therefore normally expect to undertake some form of competitive bidding process (and may in certain circumstances demand the right to receive quotations from non-syndicate institutions). In many transactions coordinating banks have been appointed to manage the bidding process and the execution of the underlying hedge transaction.

Hedging policies are important documents and will form part of the loan agreement. The terms of these policies will thus need to be carefully negotiated and drafted.

18.5.2 Interest Rate Swaps

The syndicated loans market is based on variable interest rate funding and commercial bank term loan interest rates are almost exclusively based on the variable LIBOR interbank rate. As a result, project finance debt is usually variable rate meaning that any increase in LIBOR will increase the debt service costs of the project. To mitigate against the risks of fluctuating interest rates, a variety of interest rate hedging arrangements can be incorporated into the financing structure, the most common of which is an interest rate swap.[12] Structuring an interest rate derivative into a project finance transaction does, however, raise a number of issues that need to be properly addressed. To examine these issues in more detail we will assume that a project company, X, has a 10-year US$ 100 million loan which pays interest based on LIBOR plus a 100 bp margin. The current 6-month LIBOR rate is 4% and the loan is repaid as a bullet. X would like to fix all of its interest costs pursuant to a floating to fixed interest rate swap with a commercial bank, Y.

Mechanics of a Floating-to-Fixed Interest Rate Swap

The fundamental concept of a floating-to-fixed interest rate swap is that the two parties, X and Y, make periodic payments to each other (on dates referred to as 'settlement dates') based on the difference between the floating rate of interest (using a benchmark such as LIBOR) and an agreed fixed interest rate. X will, for instance, make payments every 6 months to Y equivalent to the fixed interest rate on the loan and Y will make payments at the same time to X equivalent to the floating interest which X pays on the underlying loan. In this way, X will in net terms pay fixed interest on its underlying loan exposure. Rather than actually paying loan principal amounts to each other, the relevant interest payments are based on a notional amount equivalent to the loan amount.

The first task is to agree the fixed interest rate. A bank will typically quote a fixed interest rate based on a base rate, which is linked to the rates paid by government for bonds, a swap market premium and a credit risk premium. For project finance transactions, the actual price agreed between a borrower and

12. Other derivative contracts, including option contracts, can also be used to hedge interest rate risks.

interest rate swap providers is usually determined following a competitive bidding exercise the management of which is normally detailed in the hedging policy agreed between the lenders and project company. We will assume for this illustration that the fixed rate is equal to 3%.

On the settlement date X will pay US$ 3 million (3% of US$ 100 million) to Y and Y will pay US$ 5 million (5% of US$ 100 million) to X. In net terms X will receive US$ 2 million from Y reflecting the fact that the floating rates are at this point in time higher than the agreed fixed rate. On each settlement date during the 10-year period of the loan the net amount to be paid will be calculated and, depending on movements in the floating rate benchmark, may result in net payments by X or Y. If the swap contract is terminated for any reason (including, for instance, the bankruptcy of X), then a termination sum will be due calculated based on the cost of entering into an equivalent swap contract for the remaining term of the loan. Termination sums can be significant and, if due by X to Y, may represent a significant additional debt obligation. It is thus important to address potential swap contract termination sums in the structure of any project finance transaction.

Project Finance Structures for Interest Rate Swaps

There are a number of issues which arise out of the interest rate swap structure. Firstly, the extent to which lenders will require interest rates to be hedged needs to be agreed. This will largely depend on the cashflow characteristics of the project. Cashflows that are largely generated by long-term contracts may be sensitive to movements in interest rates, particularly if the lender cover ratios are low. Lenders may insist that a substantial proportion of the interest rate exposure if fixed pursuant to interest swap contracts. In contrast, sponsors typically argue that cashflows exposed to commodity type risks are naturally hedged. High commodity prices usually correlate with high interest rates and vice-versa. If coverage ratios are sufficiently high to absorb interest rate movements then lenders will typically agree that mandatory interest rate hedging is not a requirement.

Secondly, the treatment of interest rate derivative contracts in the financing structure needs to be carefully considered. Depending on the movements in interest rates, the project company can build up significant credit exposure to hedge counterparties and these counterparties can therefore represent very large creditors in their own right. It is thus important to establish the rights of the hedge counterparties in the financing structure including, for instance, rights to share in project security, rights to terminate their contracts and demand payment of any hedge liabilities, voting rights and so on. It is essential for hedge counterparties to be party to the intercreditor agreement and for their rights as creditors to be carefully controlled by the senior lender group.

Finally, the impact of interest rate derivative contracts on debt coverage ratios will need to be agreed. In general, the ongoing payments to interest rate swap counterparties are typically netted against debt service payments in the calculation of debt service cover ratios. The treatment of any termination payments pursuant to an interest rate derivative contract is more difficult to determine. In general, however, swap termination payments are also included in the debt service element of the cover ratio calculations.

18.5.3 Foreign Exchange and Commodity Price Derivatives

Although interest rate swaps are the most common type of derivative contract encountered in project finance, contracts for managing currency and commodity price movements also feature in project finance structures. The three main hedging instruments used to manage these risks summarised as follows.

- *Forward contracts*: a forward contract is an agreement between two parties to exchange a fixed amount of some specified item (currency, commodity, etc.) on a fixed future date at a certain price.
- *Futures contracts*: futures contracts are similar to a forward contract in that they are designed to fix prices of a particular commodity price or index in the future. Unlike forward contracts, however, futures are traded on a recognised exchange[13] and are based on standardised contracts. The value of the contract is 'marked-to-market' at specific points in time and the contract counterparty is required to make 'margin' payments in advance of the final contract settlement.
- *Option contracts*: an option contract gives the buyer of an option the right (but not the obligation) to buy or sell a specified item at a certain price on a certain future date. The option buyer pays a fee or premium in return for the option right.

There are a number of issues that need to be addressed when considering these types of derivative contract. Firstly, forward and futures contracts oblige the contract counterparties to make payments on specified future dates. The timing and size of these payments have to be carefully designed to match the underlying project cashflows. If the project cashflows turn-out to be different compared to those initially assumed then the project company could be exposed to significant cashflow risk.[14] Option contracts largely eliminate this mismatch risk but require the payment of an upfront premium which reduces the economic benefit of the hedge. Structures have been developed that eliminate the cost of the premium. In brief these structures are based on the simultaneous purchase

13. There are many futures exchanges located in different regions and each typically regulated by a particular national regulator. The largest exchanges are the New York Mercantile Exchange (NYMEX), Intercontinental Exchange (ICE) and Chicago Mercantile Exchange (CME).

14. An upstream oil field project, for instance, may experience production difficulties or require extended well workovers which interrupt production. Although the project is not generating revenues it will still be required to honour any payments obligations pursuant to a forward or future derivative contract.

of put and call options which results in a 'collar'. The options can be structured in such a way as to result in the elimination of the need to pay a net premium.

Secondly, forward, futures and option contracts typically refer to a benchmark price and this pricing basis may not be the same as the price basis underlying the project cashflows. An upstream project may, for instance, produce a particular type of crude that cannot be directly hedged. In this case a derivate contract based on one of the more widely traded crudes (Brent, WTI, etc.) will need to be used. The hedge may not, therefore, be perfect and the project will be exposed to movements in the differential between the derivative price and the actual realised sales price of the crude.[15]

18.5.4 Refinery Margin Hedging

Futures contracts are available for a variety of refined products and crude oils. A refinery both buys and sells commodities and hence a refiner could hedge both its input costs (crude oil) and output prices (refined products) by buying and selling futures contracts. This would involve the refinery entering into a variety of separate futures contracts each with its own transaction costs. A number of futures exchanges offer more sophisticated derivative contracts that combine crude oil and refined product futures together into a single contract. A variety of different combinations of futures contracts are quoted based on the concept of a 'crack-spread' being the difference between a particular refined product price a and a particular crude oil price. Crack-spread derivatives contracts are traded on several futures exchanges.[16]

Although derivatives have been used to manage refinery margin risk in a number of precedent transactions the success of the resulting hedges have been variable. It is virtually impossible, for instance, to hedge the prices of all the refined products produced by a particular refinery. The refinery will thus still be exposed to some margin risk. Even for those products for which a benchmark price does exist, the actually realised product prices can diverge significantly from the benchmark (i.e., the basis risks can be exceptionally high). Finally, these types of contract are typically not available for particularly long periods and hence the ability to hedge cashflows over the long term is constrained.

15. This risk is commonly termed 'basis risk'.

16. Crack spreads are normally quoted and traded on the basis of a 'crack spread ratio'. This ratio is used to express the relative proportions of crude oil to refined products. A common ratio is the '3:2:1' ratio which implies 3 barrels of crude oil producing 2 barrels of gasoline and 1 barrel of distillate fuel. Other ratios are also commonly quoted based on different proportions and different products.

Chapter 19

Oil and Gas Project Finance Documentation

Chapter Outline

19.1 INTRODUCTION

Project finance transactions require agreement between many different parties on a wide range of commercial and financial issues. The various parties are invariably expected to enter into long-term commitments involving sizeable financial obligations and the detailed terms agreed between these parties will typically need to be recorded in an extensive volume of legally binding documents. The purpose of this chapter is to explain how project finance structures are documented and the processes which are normally followed to achieve successful financial closing.

Section 19.2 looks at the different types of document that are normally encountered in project finance transactions. Broadly there are two categories of documentation namely: project contracts, which record the commercial structure of the financing, and finance documents, which record the financial structure. The difference between project and finance documents is important and will be explained in this section.

Section 19.3 covers term sheets and commitment letters. Prior to negotiating the detailed terms of the financing documentation, the lenders will commit to the broad structure of the financing. These broad terms are documented in a term sheet that is used as the basis for the development of the finance documents.

Section 19.4 then looks at the different types of finance document. A project finance loan agreement could, in theory, be documented in a single credit agreement. Given the number of parties involved and the detailed requirements that normally need to be documented, it is however more common for project finance transactions to be recorded in a suite of lengthy legal documents.

Finally, Section 19.5 considers the processes which are usually followed to convert a term sheet into execution version documents and ultimately utilisation of the credit facilities.

19.2 DOCUMENTING THE PROJECT FINANCE TRANSACTION

A defining feature of project finance is the abundance of agreements and contracts that are required to document the relationships between all the parties to the transaction. These agreements and contracts cannot normally exist in isolation and great care is thus needed to ensure that the various contractual arrangements between the parties form a coherent and legally binding structure which underpins the financing. Furthermore, the structure of the various agreements will govern the relationships between the parties for an extended period of time. Project contracts and documentation therefore occupy a central position in the project financing process and extensive specialist legal advice is an important element in the development, execution and negotiation of project finance documentation.

19.2.1 Different Types of Project Finance Documentation

It is often forgotten that in the initial stages of a project financing the project itself only exists on paper. Although increasingly sophisticated computer generated models often give the appearance of a tangible real-life project, in reality finance is being raised largely on the basis of an elaborate and detailed set of designs and documentation. Project finance lenders are initially funding a concept and the security for loan repayment relies almost entirely on the collection of contracts that bind the various parties together. It is thus essential to understand the purpose and importance of the different types of project finance documentation.

There are, in essence, two broad categories of project finance documentation based on the counterparties with whom the project company is dealing. The contracts that the project company signs with non-financing parties are usually referred to as 'project documents' whereas the contracts signed between the borrower and the finance parties are called the 'finance documents'. This distinction is important. In contrast to the finance documents, the lenders are not party to the project documents and hence have less ability to control the terms and management of these contracts.

Project Documents

The project documents form the commercial basis for the financing and payments made pursuant to these contracts determine the project free cashflows. The project documents will therefore be defined in the loan agreements and subject to various lender controls and restrictions. Lenders will, in addition, expect the various independent advisors to scrutinise the terms of these documents, opine on their suitability and confirm that the base case forecasts accurately reflect the project contract terms.

Material Project Contracts

Project contracts can take a wide variety of forms and it is important to establish those contracts that are materially important and those that are not. It is usually relatively easy to determine the most significant contracts in terms of risk and monetary value and it is these contracts that lenders to a project will be most concerned about. In the upstream oil and gas industry, the contracts giving the borrower the rights to the resource (whether licences, production sharing agreements or concessions) together with the product offtake agreements are usually the most important contracts. In the midstream industry, the capacity usage agreements are the most significant documents. In the downstream, feedstock supply agreements, offtake contracts and technology licences tend to be the most important. It is more difficult to determine the importance of other contractual arrangements. Certain technology licence agreements, catalyst supply agreements or technical services agreements may be critical to the project whilst others may be relatively easy to replace. Likewise, equipment maintenance and service contracts may be essential for the ongoing sustainability of project operations.

The sponsors will usually want to have as much flexibility as possible to vary the terms of project contracts whereas the lenders will want to ensure that their interests are protected and hence will want to minimise changes to the agreed forms of project documents. Defining which contracts are subject to lender controls and which are not can therefore be the subject of significant negotiation during the documentation process.

Termination of Project Contracts

Once the most important project contracts have been identified then the extent of lender control over these contracts must be negotiated and incorporated into the covenant package as part of the financing structure. The most challenging situation for the project lenders is likely to occur when a major project contract is terminated. Lenders will thus usually seek to minimise the ability of the contract counterparty to terminate. Lenders will scrutinise each of the major project documents to ensure that the termination provisions are acceptable. The lenders' attitude towards termination risk is largely determined by the ease with which a project contract can be replaced. The termination of an essential and irreplaceable supply contract, for instance, will be of considerable concern to project lenders.

As a minimum contract counterparties typically insist on the right to terminate the contract if the project company enters into bankruptcy proceedings or is unable to honour its debts. This is, however, precisely the point when the lenders want to ensure that they are able to take over the activities of the project company and continue to control the project. To avoid the risk of the major project contracts effectively disappearing as the project company begins to experience financial difficulties, the lenders will normally expect to enter into direct agreements with the project counterparties. Direct agreements can be some of the most difficult contracts to negotiate in project finance transactions but, at the same time, often provide the most important lender protections. The scope and purpose of direct agreements are examined in more detail in Section 2.4.3.

Decisions, Variations and Amendments

The terms of project agreements normally require the contract counterparties to make various decisions throughout the life of the contract. In addition, it is virtually impossible to draft a perfect contract that anticipates all possible future changes in circumstances.[1] As a result, variations and amendments to contract terms are normally inevitable at some point during the life of an agreement. A distinguishing characteristic of project finance is the extent of control that lenders usually expect to exert over contract decisions, variations and amendments. Use is often made of a decision matrix whereby all the decisions under the project contracts are identified and those decisions requiring lender input are specified (see 'reserved discretion', Section 17.6.2). A general covenant is also usually included in the finance documentation whereby the borrower is required to obtain lender approval prior to agreeing to any material amendment or variation of the material project contracts.

Project Loan Events of Default

Certain events which impact the project contracts will usually trigger defaults under the finance documents. The bankruptcy of a major contract counterparty or the termination of a material contract will, for instance, normally constitute an event of default under the project loan agreements. Project finance lenders will usually allow the project company some flexibility in

1. In economics, the theory of 'incomplete contracting' is concerned with the inability in practice to deal with the impacts of all possible future events within the terms of a contract. As a result, most contracts are likely to need some level of renegotiation during the course of the agreement. See Hart (1995).

the loan agreement to remedy the impact of project contract related defaults. This may involve replacing terminated contracts or allowing time to negotiate with contract counterparties. Given the importance of project contracts to the viability of a project finance transaction, however, lenders will want to ensure that they are protected as far as possible against material changes to the commercial structure of a project. As a result, the exact events that cause the default and the mechanisms for dealing with the consequences of these defaults are often the subject of extensive negotiation. The events of default provisions relating to project contracts can thus be complex and wide ranging.

Governing Law and Dispute Resolution

Oil and gas project finance transactions usually involve many different types of project contract each of which will be the subject of a particular governing law. In addition, the mechanisms for dealing with contract disputes will also typically be dealt with separately under the various project contracts. Given the inter-relationship between the various commercial agreements and the importance of the project contracts to the financing structure, it is important that a consistent and understandable approach to governing law and dispute resolution is adopted. If a dispute arises that impacts several project contracts then handling the resolution process through various national courts or arbitration involving different legal systems can result in significant practical difficulties and may well become impossible to manage. Careful thought at an early stage is thus required to ensure that the regime adopted for governing law and dispute resolution is acceptable to lenders.

Many project contracts will be governed by the local law of the host country. This will obviously create significant challenges when a project contract involves the government or government-related entities.[2] The reliability and predictability of local courts and local legal administration can be difficult to assess and lenders will expect to undertake significant due diligence with local lawyers on the risks which they may be taking.

Given the difficulties in resolving disputes according to traditional litigation routes through national courts, many project contracts provide for arbitration or other alternative forms of dispute resolution.[3] Although there are many advantages to arbitration, the precise mechanisms for dealing with disputes needs to be carefully considered to ensure that the overall dispute resolution framework for a project finance transaction is acceptable. Expert legal advice at an early

2. Commercial disputes involving host governments will often be referred to arbitration through the International Centre for the Settlement of Investment Disputes (ICSID) which is part of the World Bank group and provides a forum for the settlement of disputes between sovereign states and private investors.

3. It is beyond the scope of this text to explore the details of litigation, arbitration and dispute resolution in great depth. For a fuller discussion see Nolan et al. (2011).

stage in the development of a project's commercial framework is normally essential to avoid difficulties later on.

Finance Documents

The finance documents are entered into between the borrower and the project lenders and it is through these documents that the detailed terms of the various loans are recorded, including the facility amounts, repayment terms, loan pricing, covenants, events of default, security and so on. In addition, the finance documents usually include terms covering the sponsors' financial obligations and the arrangements with other providers of finance and support such as counterparties to derivative contracts and so on. In theory a loan agreement is no different in comparison to any other commercial contract and, indeed, when offering and accepting a loan the general laws of contract usually apply. In many instances, however, laws and regulations govern loan contracts in specific ways and hence special legal considerations usually apply to loan agreements (see Fuller (2000)).

Although a project finance loan could be managed in a single loan agreement, given the size of most oil and gas transactions several facilities usually need to be documented. In addition, it has become common practice to divide the various elements of the loan structure into separate documents. As a result, the number and variety of finance documents that need to be negotiated in a typical multi-sourced oil and gas project finance can be bewildering and even overwhelming. The various documents typically encountered can, however, usually be placed into a small number of categories. The terms of individual loans are documented in separate facility agreements. Each loan agreement will typically benefit from the same shared security package and the security arrangements are thus normally documented in various overarching security agreements. In addition, the structure of the project accounts is often documented in a separate accounts agreement. The relationship between the lenders under each separate facility and any other secured creditors (hedge counterparties or secured feedstock suppliers, for example) will be documented in an agreement known as an intercreditor agreement. A project financing invariably involves various parties providing guarantees, letters of credit, hedging instruments and the so on. These arrangements will also need to be documented in contractual agreements and will be included within the finance document category.

In addition to the various agreements that govern the terms of syndicated loan facilities, documentation is also required to record the terms of financing from other sources. The terms of project bonds, for instance, are documented in specific agreements that cover the marketing, underwriting, payments and administration of the bonds. Furthermore, Islamic finance is based on a variety of agreements that need to document the particular structure being used. An Ijara/Istisnaa Islamic structure will, for example, involve lease and procurement agreements together with agency provisions and so on. Export credit facilities will usually involve a variety of policy documents, guarantee agreements and agency contracts.

The various aforementioned documents are entered into between the project company, the lenders and lenders representatives. We have already seen, however, that the project sponsors perform an essential function in oil and gas project finance, including the provision of funding, various forms of sponsor support and so on. There will therefore be additional agreements that include the detailed terms of these sponsor arrangements. Sponsor and shareholder equity funding agreements are usually required, and these may need to include provisions for contingent equity, cost overrun funding commitments and so on. Completion guarantees and debt service undertakings need to be documented. The sponsors and shareholders may also be required to agree the limitations on the transfer of ownership directly with the lenders. The various documents governing the relationship between the project sponsors and the lenders will also normally need to include sponsor representations, warranties and covenants.[4]

19.2.2 Documentation Structure

The principal purpose of the various agreements that document the terms of a project financing is to ensure that the agreed rights and obligations of all the parties to the financing are clearly recorded and understood. The commercial and financial arrangements for oil and gas project finance transactions are complicated and have to function for long periods of time, often extending to well over a decade. During the period of the loan, circumstances evolve, parties may change, disagreements may occur and mistakes may be discovered. The agreements underpinning the transaction must therefore be flexible and clear enough to cope with these challenges. In particular, with so many different parties involved, there is considerable scope for disputes to occur. Uncertainty or misunderstanding of the underlying agreements usually results in a significantly increased risk that disputes will escalate. It is thus essential that the project finance agreements are structured in such a way that the rights and obligations of all the parties to the agreements can be clearly understood. We have already seen that project contracts should be structured to allow disputes to be consolidated. In addition, other contractual provisions, including force majeure, default grace periods and so on, should be conformed across the various agreements. A mismatch in force majeure provisions in different contracts could, for example, result in the project company being exposed to significant financial commitments under one contract which are not passed through into other contracts.

The structure of the various agreements can be organised in any number of ways. Common practice in large oil and gas project finance transactions is to base the documentation on a single common terms agreement that includes the major terms of the project financing. The terms of each individual loan facility

4. The project sponsors will, for instance, usually covenant directly with the lenders to provide certain specific information (such as annual reports) and take specific actions as stipulated in the relevant agreements.

are documented in the separate facility agreements. The security documents, intercreditor agreement, accounts agreement and sponsor finance documents are then documented in separate agreements.

The drafting and negotiation of the finance documents can only begin once the terms of the financing have been agreed with the lenders. We have already seen that the finance agreements will be based on term sheets that form the basis for the lender commitments. Responsibility for drafting and negotiation of the agreements rests with the various lawyers and it is essential for all parties to understand the proposed structure of the financial documentation at the earliest possible stage.

19.3 LENDER COMMITMENTS AND TERM SHEETS

The purpose of a term sheet is to document the agreed financing terms in sufficient detail so that the various parties are able to proceed into the detail negotiation of final form legal documentation. Although term sheets in themselves do not bind the parties in contract, lenders usually commit to the agreed terms by signing a legally binding commitment letter. The purpose of a commitment letter is to detail the terms upon which lenders are prepared to proceed to signature of finance documentation. A term sheet is typically attached to the commitment letter. In order to sign such a letter, lenders will need to obtain all relevant internal approvals which will typically involve some form of board or credit committee approval.[5] Large loans will usually need to be authorised by the institutions' senior management and will also require confirmation that all institutional compliance requirements are fully satisfied.[6] Once the final finance documentation is signed, the commitment letter and term sheet expire.

19.3.1 Commitment Letters

Lenders enter into commitment letters with borrowers once the terms of financing have been agreed and the loan has been approved. Although there is no prescribed form of commitment letter, for the majority of oil and gas project finance transactions the LMA standard form generally serves as the basis for the document. The following terms are usually included in a commitment letter:

- *Commitment to lend*: For a syndicated loan all lenders in the syndicate will typically sign the same letter (on a several basis) that will detail each lender's respective commitment amount. Lenders will confirm that they have the necessary approvals to lend and that they are satisfied with the term sheet and due diligence reports.

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5. Project sponsors should not under-estimate the time and effort institutions require to obtain relevant approvals for project finance loans. Commercial banks will usually require at least four to six weeks to process project finance loans. In addition, board and credit committee approvals often include conditions which in some cases can be onerous and challenging to fulfil.

6. Certain regulatory compliance requirements can place a heavy burden on the project finance process. 'Know your customer', anti-bribery and corruption and sanctions requirements have, for instance, recently created significant challenges in project finance documentation process management.

- *Conditions*: The letter will usually contain a list of general conditions to lend (such as the agreement of satisfactory documentation, know your customer[7] checks and so on) as well as specific conditions to the particular transaction (including completion of outstanding due diligence, finalisation of model assumptions and so on).
- *Material adverse change*: The lenders will typically expect their commitments to be non-binding if events occur that adversely impact the borrowers' business, its ability to perform its obligations or the relevant financial markets.
- *Clear market*: If the commitment involves an underwriting then the underwriters will expect the project sponsors to ensure that there are no competing transactions syndicated at the same time that may impact the ability of the underwriters to syndicate the loan.
- *Market flex*: If the commitment involves an underwriting then the underwriters often include market flex language that allows them to change the pricing and even the structure of the financing. The exact wording of any market flex clause will usually be heavily negotiated given that any changes to the structure and pricing of a project finance transaction can have a significant impact on the viability of the underlying project.
- *Syndication*: Commitment letters include detailed provisions on the syndication process, including the preparation of and responsibilities for an information package, availability of the sponsors and borrower representatives at road shows and so on.
- *Termination*: The commitment will usually expire after a specified period of time (usually six to nine months) and if certain events occur, including, for instance, signing of the loan documentation.

A single commitment letter will normally be signed by the all lenders and will include general provisions such as loan pricing, allocation of roles and so on. Clearly the signing of a commitment letter is a major milestone in the financing process for any project financing and will mean that the project has a degree of funding certainty albeit subject to documentation and conditions precedent.

19.3.2 Term Sheets

Term sheets broadly fall into two formats namely: 'short form' and 'long form'. It is important to establish at an early stage the most appropriate approach and hence the level of detail that should be incorporated into a term sheet. A short form term sheet includes only the basic commercial terms of the financing, often in summary format. The document can be as short as one or two pages and often there is no involvement of legal counsel in the drafting of the terms. In contrast, a long form

7. Each lending institution will usually have its own requirements regarding the checks and documentation required to initiate a lending relationship with new customers. These requirements are determined by relevant regulatory authorities and can vary between jurisdictions, nature of the transaction and so on. The various rules and requirements are complex and significant time and effort is typically required to complete the necessary checks.

term sheet usually encompasses all the major terms of financing, including many legal clauses. The document may extend to over three or four hundred pages and is often produced with significant legal input. Many of the terms of a long-form term sheet can be transferred directly into the final finance documents.

The advantage of using a short-form term sheet is that it can generally be drafted with minimal legal input and the key commercial terms are usually easily identifiable. Many elements of the financing structure are left to documentation on the basis that customary terms will be used (a short form term sheet will, for instance, often refer to LMA standard wording). The difficulty with this approach is that once the lenders are engaged the negotiations can become complex if specific wording and terms are required to accommodate particular features of the financing. It is therefore often better to ensure that as few terms as possible are left for negotiation during documentation. For large project finance transactions with sophisticated sponsors and complex structures it is more common for long-form term sheets to be used.

As noted earlier, the LMA has developed a standard form term sheet document which is useful as a reference for general terms.[8] The broad terms covered in this term sheet include: the parties to the financing, including a description of the facilities, sponsor support and equity provisions, conditions precedent, representations and warranties, covenants, events of default, security and various other 'boiler-plate'[9] terms.

19.4 PRINCIPAL TERMS OF THE FINANCE DOCUMENTS

The purpose of the following sections is to explain the functions of the major financing agreements that are usually encountered in oil and gas project finance.

19.4.1 Common Terms Agreement

The purpose of the common terms agreement is to record the loan provisions which are common to the various different tranches of debt. This form of agreement is especially useful in project finance transactions as it ensures a degree of conformity between the various lenders to the projects. As we shall see in later sections, a fundamental principal of multi-sourced project finance is that the senior creditors in each loan facility are treated equally. Each lender to the project is reliant on the same project cashflows and, as a result, a great deal of time and effort is spent to ensure that no set of senior creditors is put in an advantageous position compared to others with the same claims. Incorporation of shared terms into a single document helps to ensure consistency of treatment between the various facilities. There is no standard form for common term agreements and the detailed terms and provisions of these agreements vary

8. Refer to the Loan Market Association (2015).

9. The term 'boilerplate' is used to refer to standard or routine clauses which are incorporated into finance agreements and project contracts.

from project to project. The following terms are, however, typically included in these types of agreement:

- The purpose of the loans
- Conditions precedent to the first and subsequent drawdowns
- Drawdown mechanics
- Interest rate calculations
- Representations and warranties
- Covenants
- Events of default
- Financial ratios and cashflow forecasts

The common terms agreement is also likely to include a variety of market standard clauses that are commonly found in all syndicated term loan facilities. The clauses are typically taken from the LMA standard form loan documentation. During the negotiation of the documentation for a project financing the lenders' starting position will in fact usually be the standard LMA wording relevant to the area of negotiation and any deviation will need strong justification.

Representations and Warranties

The parties to any commercial contract usually make a variety of factual statements that form the basis for the contractual agreement. Loan agreements are no exception and, given lenders' reliance on specific facts concerning the project being financed, representations and warranties have particular importance in project finance transactions. The borrower usually makes representations and warranties concerning its own status, its powers to enter into the loan agreements, various aspects of the project contracts, the absence of breaches, litigation and disputes, compliance with laws, permits and approvals, validity of project finance security and so on.[10] If a representation or warranty turns out to be untrue then an event of default will occur. An event of default will, however, usually only occur if the breach has a material adverse effect.

Representations and warranties will also usually be provided by a variety of other parties to the project finance transactions, including the sponsors, any guarantors and contract counterparties. The details of the various representations and warranties and the criteria used to determine whether breach will result in a default can involve extensive and protracted negotiation.

Covenants

The role and nature of covenants in project finance transactions has been covered in Sections 2.2.3 and 17.6.2.

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10. The various representations and warranties will usually be made at the time of the signing of the loan documentation. Many of the representations and warranties will also be repeated at various points throughout the life of the loan, including on the loan drawdown dates, project completion and so on.

Events of Default

Project finance loan agreements include an extensive list of events of default.[11] If an event occurs that results in a default then the lenders will have the benefit of various rights or remedies, including the ability to cancel commitments, accelerate outstanding amounts and enforce security. These remedies will usually be subject to cure rights and grace periods, the details of which are normally the subject of extensive negotiation.

Many project finance transactions have included various categorisations of events of default with differing remedies depending on the exact circumstances of the default. In larger transactions, for instance, the following three categories of default are often encountered.

- *Fundamental events of default*: These are events of default that provide lenders with full remedies throughout the period of the loan. The types of events included in this definition include non-payment under the loan agreements, project abandonment, expropriation and so on.
- *Project events of default*: These are events of default that are designed to allow lenders full remedies once the loan has become completely non-recourse. If, for instance, lenders benefits from sponsor completion support then project events of default are unlikely to be operative during the pre-completion period.
- *Sponsor events of default*: These events cover sponsor related defaults which apply during periods when the project lenders are principally relying on the financial obligations of the sponsors to service debt (pursuant, for instance, to a pre-completion debt service undertaking). The lenders' remedies in these circumstances are typically limited to action against the particular defaulting sponsor or sponsors.

Given the significance of the events of default provisions, remedies and enforcement proceedings in many project finance transactions, these areas can be difficult to negotiate. The resulting structures and associated mechanisms can thus become lengthy and complex.

19.4.2 Facility Agreements

The individual facility agreements will contain the detailed terms and provisions for each of the different tranches of debt. Given that the majority of the terms of financing are incorporated into the common terms agreement, the individual facility agreements are often relatively short documents. The following terms are usually covered:

- Description and amount of the facility
- Principal repayment schedule

11. Typical events of default include non-payment of amounts due under the loan agreement, breaches of a covenant, a representation or a warranty, illegality, insolvency of the borrower or key contract counterparty, cross-default, material adverse change, termination of a key project contract, failure to achieve completion by a certain date and failure to achieve minimum cover ratio tests.

- Interest, margins and fees
- Facility agency provisions

Facility agreements will also usually include specific terms that apply only to individual facilities such as special conditions precedent, detailed procedures for decision making and voting and so on. In addition, certain further facility specific documentation may be required such as insurance policies or guarantee documentation for ECA loans.

A multi-loan project financing will usually include a commercial bank facility agreement, facility agreements for each ECA supported loan and facilities for other specialist forms of financing such as an Islamic facility agreement. Each of the facilities will be documented in a separate facility agreement and each will appoint its own facility agent to interface with the borrower on behalf of the lenders within each facility.

19.4.3 Intercreditor Agreement

The function of an intercreditor agreement is to set out the relationship between the various creditors to the project company. If a transaction involves multiple different types of creditor and creditor classes then, without agreement between the creditors, each would be able to take actions and make decisions independently. Given that the lenders to a project financing are all relying on the same cashflows to service their debt, independent action by different groups of creditor would result in an uncoordinated situation to the detriment of all. It must also be understood that it is not only senior creditors which need to coordinate. It is also important to ensure that the actions of subordinated and unsecured creditors are carefully coordinated, controlled and recognised. Other parties will need to be included in the intercreditor arrangements, including parties providing guarantees (especially ECAs) and hedge counterparties. Intercreditor agreements therefore perform an essential role in oil and gas project finance transactions and, given the number of parties involved and the divergence of interests, these agreements can become extremely difficult to negotiate.

A wide range of issues need to be governed by the intercreditor agreement including:

- The ranking of creditors, the priority of cashflows and sub-ordination provisions.
- Mechanisms for decision-making.
- Voting rights for different creditor groups.
- Sharing of funds between the various creditors.
- Acceleration, security of enforcement and the application of proceeds.

Probably the most important feature of intercreditor arrangements, and often the most difficult to negotiate, concerns the voting rights of particular creditor groups. The basic idea is to ensure that the various creditor groups act in a coordinated manner. Everybody is in the same boat and the goal is to promote a harmonious existence. To add to the challenge, projects are not static and decisions must to be made throughout the project life. Given the control rights of the lenders, many decisions will need to be referred to a potentially diverse lender group and hence some form of voting and decision-making mechanism will have to be developed. There are a variety of ways in which decisions can be made and votes allocated to the different parties. At an early stage, however, basic decisions need to be made covering matters such as who can and cannot vote and the threshold percentages of votes required to make particular decisions. Some of the more common features of the decision-making and voting regimes include:

- *Intercreditor agent*: An intercreditor agent is normally appointed to administer the provisions of the agreement in particular decision-making and voting.
- *Voting*: The most common voting regime involves each lender group voting pursuant to its specific facility. The votes are then cast by each facility as a block and weighted according to the relative amount of a particular facility.
- *Categorises of decision*: Three categories of decision are commonly defined, namely: fundamental decisions, majority decisions and administrative decisions. A unanimous vote is normally required to pass a fundamental decision, two-thirds of the votes for a majority decision whilst administrative decisions are often made by the agent alone on behalf of the syndicate.[12]

Certain categories of creditor often require special treatment under the intercreditor agreement. Hedge counterparties, for instance, are usually excluded from voting rights unless the decisions are concerned with the acceleration of outstanding debt obligations and the enforcement of security. Shareholder or sponsor related creditors (sponsor senior lenders, for instance) are likewise typically excluded from the general voting regime given the potential for conflicts of interest to arise from their other interests in the project. Furthermore, the voting mechanisms for bond tranches are typically altered and in many ways simplified to accommodate the fact that it is less common to approach bondholders directly for decisions.

Intercreditor agreements are of central importance to the successful working of a project finance transaction and hence should be carefully planned and negotiated. Although it is unlikely that a financing will fail due to the inability to negotiate intercreditor terms, unless properly managed and thought through intercreditor negotiations can become protracted and, in the worst case, result in the need to re-configure elements of the financing structure.

19.4.4 Accounts Agreement

A distinguishing feature of project finance is the control that lenders exert over the bank accounts of the project company. The lenders will specify which accounts

12. The exact percentage thresholds and terminology used in a particular project finance transaction will depend on specific circumstances. The voting mechanisms for large multi-tranched oil and gas project finance facilities can be significantly more intricate and sophisticated.

the borrower is to open and maintain and how cash will move into and out of these accounts. The borrower will enter into an accounts agreement with the account bank. This agreement will include all of the detailed terms governing the opening, operation and maintenance of the various accounts. The accounts agreement will include provisions for the appointment of an account bank (or more commonly two account banks, one for offshore accounts and one for onshore accounts). The following accounts are typically found in oil and gas project financing.

- *Proceeds or disbursement account*: During the construction period the borrower will drawdown funds to pay for project costs. The proceeds account is an account into which debt drawings and any equity funding is paid. Funds in the proceeds account are then used to pay for project costs in accordance with the drawdown mechanisms as specified in the finance documents.
- *Revenue account*: Once the project is complete and starts to earn income from the sale of its products, the funds earned are deposited into a specified account. For products earning dollar revenues the accounts are usually held 'offshore' in London or New York. For large projects the amount of funds passing through the revenue account can be substantial. A 200,000 bbls per day refinery, for instance, will generate around US$ 16 million each day. Cash from the revenues account will be transferred to other accounts according to the agreed cashflow waterfall.
- *Operating accounts*: Funds standing to the credit of the operating accounts are used to pay for ongoing operating costs. An 'onshore' account is typically opened to pay for local costs. Other operating costs may be paid directly out of the revenues account.
- *Compensation and insurance accounts*: Project finance lenders usually seek to maintain control over insurance proceeds and any form of compensation that may be paid to the borrower. Compensation and insurance proceeds will thus typically be paid into a segregated account and will not be subject to the usual cash waterfall. Special provisions will apply to the payments out of this account and, if material, such payments will be carefully controlled by the lenders and, in certain circumstances, used to prepay outstanding debt.
- *Reserve accounts*: In addition to ensuring that there is sufficient ongoing cashflow coverage to pay debt service, project lenders also normally insist on the borrower maintaining sufficient reserves of cash to cover debt service for a minimum period. The borrower will usually need to maintain a six-month debt service reserve account which holds sufficient funds to cover the next six months' interest and principal. Lenders may also insist on other reserve accounts, including maintenance reserve accounts, volatility reserve accounts and so on.
- *Distribution accounts*: Lenders usually exert significant control over the aforementioned accounts. Funds at the bottom of the waterfall once all operating costs are paid and reserve accounts funding can be disbursed to the sponsors as distributions. These funds are generally held in an unsecured distribution account over which the lenders have limited control rights.

The movement of cash between the various accounts is governed by an order of priority that is detailed in the accounts agreement. Lenders will also want assurance that any cash held by the project company is invested according to pre-agreed criteria. The project company will usually only be allowed to make relatively safe investments and various conditions will be included in the finance documents to protect the lenders interests. These conditions include the requirement to ensure that the investment are held in the name of the account bank and that the borrower reports movements and balances in investments on a regular basis. In addition, rather than maintaining large cash balances, lenders usually allow the project company to substitute funds in certain specified reserve accounts with letters of credit or other forms of acceptable credit support.

19.4.5 Security Documents

Lenders usually take security for their loans so that, in the event the borrower is unable to repay the loan, the lenders can take possession of secured assets, sell such assets and use the proceeds to repay the loan. Given the potential value of the secured assets the lenders will want to ensure that the value of the assets is preserved. Hence in addition to the granting of secured interests to the lenders, security documentation also contains provisions that govern the way the borrower manages the security. Lenders will, for instance, expect the secured assets to be properly maintained and insured.

Ensuring that lenders have effective security interests in the various different types of project assets can present significant challenges, especially in jurisdictions that have less favourable security laws. The security aspects of a project financing can thus become extremely complex and time consuming. The effort required to develop a bankable security package should thus not be underestimated. The local laws where the relevant assets are located will usually dictate the requirements to create effective security interests. The lenders' ability to enforce their security interests and deal with the secured assets is also largely determined by local laws. As a result, specialist legal advice may be needed in several different jurisdictions. In addition, perfecting the security interests will usually entail local registration and the payment of various duties and fees. The costs associated with the creation and maintenance of effective security interests in the project assets may, in fact, end up being prohibitively high.

The creation of effective security interests often also requires notification or approval from various parties. Security interests over the rights in project contracts will, for instance, usually require the acknowledgement of the contract counterparties. A particular challenge in upstream project financing concerns the creation of security interests in the underlying rights to the petroleum resources. It is often challenging to perfect security interest in government licences, concession agreements or production sharing agreements. Furthermore, the ability of lenders to enforce any interest in the petroleum rights is highly questionable in many jurisdictions. The fact that these rights are often held in unincorporated joint venture arrangements adds further complications.

19.4.6 Equity and Sponsor Related Documentation

The loan documentation and agreements discussed so far are principally concerned with the relationship between the lenders and the project company. We have already seen, however, that the project sponsors play a critical role in project finance transactions. As a minimum, the project sponsors are normally obliged to provide equity finance in the form of share capital or subordinated loans. In many projects the sponsors' financial obligations go far beyond equity finance, however, and may include completion support, cost overrun commitments and so on. The agreements that govern the terms of the sponsors obligations usually sit alongside the financing agreements entered into between the project company and the lenders and form an essential component of the full package of documentation. The terms and form of these agreements need to be carefully negotiated and drafted to ensure consistency with the other documentation.

Lenders will typically expect firm contractual commitments from the project sponsors to fund their equity share of project costs and these commitments are usually documented in shareholder equity funding agreements. An important issue that needs to be carefully considered, however, is the structure of the shareholding in the project company. Project sponsors usually fund their share of equity through entities within their global corporate groups and may even establish special purpose funding vehicles to manage the shareholding. The commitment to fund may therefore often be an obligation on a corporate entity that has limited financial resources. Further documentation is therefore required to ensure that the sponsor funding commitments are backed up by credit-worthy counterparties. Parent company guarantees may be necessary or third-party letters of credit that support the equity funding obligations.

The detailed terms of the equity contribution agreements should cover the form of funding (share subscriptions, subordinated loans and so on), amount and timing of the base funding requirement, cost overrun commitments and subordination issues. The lenders may also insist on the acceleration of sponsor funding, especially if specific events cause the project company to default. As discussed in Section 2.3.2, project sponsors generally prefer to fund their obligations through subordinated loans rather than subscribing equity into the project. Separate loan agreements are required to document the terms of these subordinated loans. Repayment of sponsor subordinated loans are usually based on cashflow which would otherwise be distributed as dividends. The detailed mechanics of any sponsor subordinated loan will thus need to reflect the priority of cashflow as detailed in relevant account waterfalls.

Other forms of sponsor undertakings also need to be documented. We have seen already that project finance lenders normally seek to restrict the ability of the sponsors to transfer or sell their interest in the project. Although sponsor-transferred restrictions are usually included in the project company covenant and events of default package, this is normally insufficient on its own and lenders will also expect direct undertakings from the sponsors. Separate share transfer agreements are generally required to detail these restrictions.

Finally, documentation is also required in relation to equity bridge loans. Equity bridge loans are often provided by third-party lenders to fund the sponsor equity contributions of the sponsors. These loans are subordinated to the senior project loans and normally have to be repaid by the sponsors prior to the project completion date. The third-party lenders providing the funds pursuant to the equity bridge loans will benefit from sponsor guarantees. The terms of equity bridge loans will impact the funding obligations of the sponsors pursuant to the funding contributions agreements. The sponsors will commit to fund their contributions to repay the bridge loans.

19.4.7 Other Finance Documents

A variety of other important finance documents are often encountered in project finance transactions. These include the various documents required to record the terms of working capital agreements, hedging contracts, letters of credit, and bond documentation. Many of these agreements and documents are based on standard form contracts. Given the close interaction between the various different financing agreements, however, it is essential that any additional financial documentation is carefully conformed to the other agreements in the project-funding package.

Capital markets documentation can, in particular, create some challenges that need to be carefully managed. The process for issuance of a bond involves specific documentation and a separate subsidiary of the project company is often established to issue project bonds. As well as additional financing documentation, specific corporate documentation relating to any specially incorporated issuing entity will be required. An investment bank (or group of investment banks) is engaged to lead manage the process pursuant to a mandate letter. The lead manager prepares an offering memorandum, engages the rating agencies to rate the bond and markets the bond to investors. The lead manager and the investors enter into a subscription agreement pursuant to which the investors agree to subscribe for the bonds. A bond trustee is appointed to manage the bond on behalf of the investors and this trustee is appointed pursuant to a trust deed. A paying agent is also appointed to management the coupon and bond principal payments. It can thus be seen that a variety of different agreements need to be managed as part of any capital markets issuance process and that these must to be carefully structured so as to conform to the other related project finance documentation.

Derivative transactions used in project finance also require specific consideration. The most common form of derivative used in project finance is the interest rate hedge. Currency and commodity hedges are used but are much less common. Derivatives are usually transacted using relatively standard documentation produced by the International Swaps & Derivatives Association (ISDA).[13] The principal document which contains the terms and conditions of

13. The ISDA was founded in 1985 and is trade organisation whose aim is the promotion of an efficient and standardised market for derivative products.

a typical interest rate swap transaction is the ISDA Master Agreement. The standard terms of this agreement usually need to be modified and specifically negotiated for project finance transactions. As already noted, the ability of swap counterparties to terminate the swap will be significantly curtailed. The standard master agreement termination rights are therefore usually disapplied and replaced by the provisions of the project finance intercreditor agreement and common terms agreement. In addition, mechanisms will need to be introduced to manage the amount of the swap notional amounts according to the drawings, repayments and prepayments of the underlying loans. A further complication relates to loan transfers as lenders will often want to ensure that the relevant portion of any outstanding swap exposure is reduced at the same time as a loan transfer. This can, in practice, be difficult to achieve.

19.5 PROJECT FINANCE DOCUMENTATION PROCESSES

The aim of the documentation process is to develop a full suite of finance documents that can form a legally binding set of agreements allowing the project company to drawdown the project loans and fund the project through to completion. The process starts with an agreed term sheet and moves through to signing of the finance agreements, fulfilment of the conditions precedent and ultimately drawing of the loans. The project finance documentation process is further complicated, however, due to the central importance of the project contracts that will be negotiated in parallel to the finance documents. Not only do all the finance parties need to be organised and coordinated but also the various project contract counterparties. Because of the number of parties involved, the complexity and interdependence of the underlying documentation and the variety of agreements which need to be managed, careful coordination and management of this process is vital to ensure that funds are available on-time. Delays in the process will usually mean that project costs will need to be funded either from sponsors own funds or other sources of temporary finance. In the worst case the project may actually run out of funds all together.

19.5.1 Principal Tasks, Activities and Milestones

There is no ‘standard’ project finance documentation process and each transaction will vary depending on the particular features and circumstances of the project. The process to achieve first drawdowns is complex and challenging for a number of reasons. Firstly, financing of projects is not an isolated and independent activity. The financing task must work alongside the other project development activities which include engineering, commercial, insurance and so on. Each activity interfaces closely with the other activities and effective information flow between the various activities is essential. Secondly, project financing is more often than not raised for joint ventures. The decision-making processes between the joint venture partners can become problematic. Differences of opinion between the various sponsors to a project during negotiation of documentation can cause considerable frustration to all parties to a project financing. Thirdly, in addition to the joint venture partners a significant number of other parties are often involved in the process, including the senior lenders, contract counterparties, all the respective legal counsels, various consultants, government representatives, insurers and the like. These parties need to be managed and controlled throughout the process.

The starting point for the documentation process is the term sheet. The documentation stage can only start once potential lenders have agreed to the terms of the financing hence at this stage the terms and conditions should have been approved by the group of lenders. There may, however, be a number of areas of the financing that have yet to be agreed. It is essential to understand, however, that any changes to the term sheet, any new terms or the resolution of outstanding term sheet items will require lender approval and, depending on the nature of the issues and particular approval processes of the individual institutions, may involve lenders obtaining internal credit approvals. The ideal starting point for the documentation process is, therefore, a detailed term sheet, fully approved by all the lenders with no outstanding items. This will allow the documentation process to focus on the legal requirements for binding finance documents. In practice this ideal situation is virtually impossible to achieve and ongoing negotiations of terms will normally be required throughout the documentation process.

Negotiating the Financing Agreements

The first draft of finance documents is developed from the term sheet, is generally based on LMA standard terms and forms the basis for the documentation process. It is vital to ensure that responsibility for developing the first drafts is properly understood by all the parties to the transaction. The lenders legal counsel will normally produce the first draft on behalf of the project lenders. Given the difficulty in managing lender groups, when dealing with large syndicates it is common to appoint one of the commercial banks to negotiate terms of the financing on behalf of the lender group (this bank is known as the 'documentation bank').

The process described so far is common for many types of loan transaction, whether project finance or not. For project finance transactions, however, other project development activities will usually have a significant impact on the financing process. As a result, one of the most significant challenges in the documentation phase of project finance transactions is the ongoing evolution of the project that takes place in parallel with the financing activities. In addition to the finance parties, the project sponsors and their advisors will normally be negotiating more widely with contractors, offtakers, feedstock suppliers and governments. Furthermore, the process for obtaining critical permits and approvals will need to be moved forwards, insurance programmes will need to be placed in the market and environmental surveys, management plans and so on will be in the process of development. If a bond is being issued then the issuing documentation will need to be prepared, roadshows to investors organised and so on. As these other activities develop, lenders will usually require updates to the due diligence reports and possibly even updates to critical assumptions that underpin the base case cashflow forecasts. Coordination of the various lenders' consultants in preparation for final reporting to the lender group will thus also need to be carefully managed. In addition to the documentation bank, therefore, other banks may be appointed to manage specific elements of the project, including technical, modelling, insurance and other roles banks are often appointed.

The process for completing all of the aforementioned tasks can last for a significant amount of time, extending over several months. Over this period external events can impact the project, sometimes to a considerable extent. Major macroeconomic changes, for instance, can be especially problematic and impact the overall viability of a project. As an example, large movements in the oil prices can fundamentally change the base case forecasts and require renegotiation of the commercial and financial arrangements.

Signing the Agreements

Signature of the various financial and commercial agreements binds the various parties into legally enforceable contractual rights and obligations. The signing of the project finance agreements is therefore a significant event with far-reaching consequences for all concerned. The lenders and sponsors become legally obliged to fund significant sums of money and likewise the various project contract counterparties make legally binding promises that may involve commitments extending over decades. Significant time and money will have been spent by all parties to reach the stage of documentation signing and hence any upsets (and there are many past examples) can be at best embarrassing and at worst deal threatening.

All parties will need to have approval and capacity to sign. This sounds obvious but in practice can be more challenging than expected. Institutions may find out at a late stage that they do not have the regulatory capacity to carry out a certain role. An example could be an offshore account bank not being authorised to act in such a capacity. Contract counterparties need to have board approvals to sign contracts. It has been known for boards to decline to approve signature of a major contract, such as an EPC contractor failing to sign a construction contract.

Conditions Precedent and First Drawdown

Although signing of the documentation means that the financing agreements are legally binding, the lenders are not obliged to disburse funds to the borrower until various conditions have been fulfilled. These conditions precedent are included in the loan agreements to give the lenders assurance that various fundamental matters relevant to the finance have been satisfactorily completed. The most important conditions precedent include:

- Delivery of the executed finance, project and security documents.
- Delivery of satisfactory due diligence reports.
- Delivery of the agreed financial model demonstrating a base case with agreed coverage ratios.
- Completion and delivery of all relevant consents, permits and approvals.
- Confirmation that all insurances are in place and delivery of brokers letter of undertaking.
- Delivery of legal opinions.[14]

The detailed list of documents that need to be delivered to fulfil the conditions precedent can extend to well over a hundred items and, hence, the conditions precedent process can be time consuming and complex. It has been known for conditions precedent fulfilment to create significant challenges resulting in delays to first drawdown of several months or even up to a year.

5.1.4 Post-Signing

Once the finance documents have been signed all of the various roles that are detailed in the financing documents become active. Agency functions become live and the obligations of the parties to the financing become formalised. The documentation, however, rarely remains static and terms often need to be modified even when the project is performing as expected. When projects experience financial difficulties it is inevitable that more fundamental changes may be required.

19.5.2 Agency Functions and Bank Roles

Given the number of different parties involved in a typical syndicate for an oil and gas project finance transaction, proper organisation and management of the diverse group of entities involved in the various processes is essential. An extreme position would entail the borrower interacting with each individual creditor directly. Even in a relatively small commercial bank syndicated loan this does, however, become completely impractical. There are too many issues to deal with and too many daily interactions to manage even without unexpected events impacting the project. To efficiently manage the loan, a facility agent is almost invariably appointed to act on behalf of the lenders

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14. Legal opinions play an important role in most types of loan transactions. These opinions typically cover the status, incorporation and empowerment of the borrower, authorisation, execution and validity of the transaction, security, litigation and so on. The wording of legal opinions is largely standardised and includes assumptions, qualifications and information on the documents examined. Opinions may be provided by a number of legal advisors, including the lenders' counsel, borrowers' external counsel or in-house counsels. Given the variety of different parties and the number of jurisdictions normally covered, the set of legal opinions required for a project finance transaction can be considerable and far in excess of a more standard corporate-type loan transaction. For further information on legal opinions see Wood (1995b).

and manage the communications and transactions between the lender group and the borrower. The facility agent for a standard syndicated corporate loan will usually take responsibility for a number of important tasks, including collecting and managing payments between the borrower and the lender, setting interest rates, administering voting and decision-making, acting as a focal point for information flow between the parties and so on. The complexity of project finance transactions usually involves the agent in a more onerous set of tasks. Administration of the loans may involve additional detailed work on the project, including the coordination of lender experts for ongoing project reporting, updating the financial model, calculating ongoing coverage ratios, ensuring compliance with covenants, holding and managing the lenders' security interests and administering the various project bank accounts and funds' flow between accounts. As a result it is almost invariably the case that the facility agent role will be supplemented by other agency roles performed by other lenders within the lending group. The most common agency and role functions include:

- Security trustee and agent
- Account bank (usually onshore and offshore)
- Specialist roles, including technical bank, environmental bank, modelling bank, insurance bank and so on.

We have already seen multi-sourced loans require the administration of multiple creditors whose relationship is typically governed by an intercreditor agreement. Each facility will have a separate facility agent and the interaction of the various lending tranches will be administered by an intercreditor agent.

19.5.3 Documentation Evolution: Amendments, Waivers and Restructuring

Despite all the time, cost and effort which goes into developing a fully documented and successful project finance transaction, it is virtually impossible to develop a financing structure that will not require some form of alteration during the life of the project. In more serious situations, the fundamental structure of the financing could require wholesale reworking. Severe revenue shortfalls due to unpredicted events could mean, for example, that there is insufficient cashflow to service all debt. In this scenario, the repayment terms may need to be rescheduled, the debt levels reduced and alterations made to the lenders' control rights and security structure.

Amendments and Waivers

Mechanisms are included in project finance loan agreements to allow the project company and lenders to agree to amendments and waivers to the documentation. The borrower will normally approach the agent bank with a formal request to amend specific clauses or waive particular decisions. The agent will then request the lenders to decide on the proposal and, if approved, relevant changes can be made to the documentation.

Restructuring

Problems which arise during the term of the financing can endanger the whole project and it is not uncommon for events to occur which do in fact render the project unbankable. More often, however, changes can occur that require a restructuring of the financing and result in changes to the composition, structure, timing and/or cost of the financing. Careful management of the project financing process is required and flexibility in the approach needs to be adopted. Some examples of issues which have arisen on projects include:

- Political events directly impacting the project. A new government could mean changes in the underlying legal basis for the project, including changes to the terms of concession or licence agreements with the host government. In addition, sanctions by third-party governments can directly impact the ability of a project to procure services and equipment or raise finance.
- Macroeconomic factors can change the commercial viability of a project. Governments have been known to impose exchange controls when currencies come under pressure. Falling oil and gas prices, rising construction costs or economic depression can radically alter the base case cashflow forecasts.
- Changes to key counterparties of project agreements can occur. Examples include the loss of an EPC contractor, bankruptcy of an offtaker or acquisition of a contract counterparty by another entity.

The aim of corporate restructuring is to allow a company to renegotiate its financial obligations and so avoid bankruptcy or liquidation. The need for restructuring comes about when borrowers experience cashflow difficulties which threaten their ability to service debt obligations. Corporate restructurings are invariably complex and difficult especially when the different corporate insolvency laws are considered. Restructuring negotiations are carried out in the context of the surrounding applicable insolvency law framework and ultimately a borrower's creditors will enforce their claims within the constraints of local bankruptcy laws and institutions.

The fact that project finance is based on the cashflow generating ability of a single project and that these cashflows are usually generated from long-term contractual arrangements adds a further level of complexity to restructuring project finance transactions. In addition to financial restructuring, an element of restructuring is often required to the commercial framework of the project and this will inevitably involve negotiations with other non-financial parties. The objectives of the parties to the project company's various commercial contracts will usually be focused on ensuring that the borrower's obligations to pay for goods and services will be honoured. A feedstock supplier could, for instance, hold the company to ransom by threatening to suspend or terminate vital project feedstock. Likewise the threat of cancellation of a mineral licence can be equally concerning to the borrower and its creditors. Should these kinds of action actually happen then the consequences would obviously be fatal to the project.

In most oil and gas project finance transactions the group of creditors is usually diverse and varied with potentially different security interests and different amounts at stake. Some of the creditors may be conflicted due to, for instance, their additional role as a project sponsor or contract counterparty. Some creditors may want to work through the issues on a consensual basis due to strong sponsor relationship reasons. Others may be much more inclined to take an aggressive stance and seek to push the negotiations to the edge of bankruptcy proceedings. Getting agreement on the best course of action can thus be extremely difficult especially if external developments are moving rapidly.

The usual course of action at an early stage is to establish a steering committee and to come to agreement on the most appropriate method of dealing with the negotiations. The various parties will normally enter into a standstill agreement, the purpose of which is to suspend creditor actions and give the parties time to negotiate the restructuring proposal. The majority of restructurings will involve the borrower and creditors agreeing to new terms of finance, including potentially reducing the debt service (by deferring principal), altering the composition of the debt and potentially even writing off amounts of debt.

19.6 CONCLUDING REMARKS

The sections in this final chapter have shown that the project finance documentation process is complex and challenging, requiring considerable time and effort from all parties involved in the transaction. The fundamental principles of all project finance transactions rest on the concepts of risk analysis, risk mitigation and project economics. Whatever project is being financed there will almost inevitably be a variety of different parties involved in the commercial and financial structures and the final legal binding documentation will need to reflect the often complex arrangements that have been agreed between the various contract counterparties. Although project finance loan documentation usually makes reference to the LMA model syndicated loan agreements, the documentation for project finance transactions is far from standardised. Each financing requires its own bespoke approach. The documentation process for a project finance transaction therefore needs careful management to ensure that the costs and time required to convert an agreed term sheet into a first drawing are not excessive or prohibitive.

Throughout this book we have moved from the basic definitions and ideas that underpin all project finance transactions, through the complex petroleum industry value chain and associated project risks in each sector of the industry and finally into the detailed structuring and documentation of project finance transactions in the sector. It should now be apparent that the inherent flexibility and adaptability of project finance techniques are both a benefit and a hindrance when using this form of finance to raise funds. Project finance has been applied to a wide range of projects in all sectors of the petroleum industry. Its adaptability has, in addition, allowed projects to be financed in innovative and evolving ways. As the petroleum industry had matured and continues to grow in new and often unpredictable ways, project finance has demonstrated its ability to handle new risks and commercial structures. The difficulty with project finance, however, is its reliance on extensive risk analysis and risk mitigation involving time consuming due diligence and often-challenging negotiations with multiple third-party contract counterparties and financiers. Complicated projects in difficult jurisdictions can take years to close and the costs and fees paid to the various consultants and advisers often add significantly to the overall project costs.

Even though project finance has its challenges, this method of funding has an impressive track record and is used by many of the largest and most influential entities in this industry. Despite the often 'tectonic' changes that have historically characterised the industry, project finance will continue to perform an essential role in raising capital in all sectors of the oil and gas value chain. This book has thus provided a framework for approaching project finance in the international petroleum industry with reference to basic techniques that will remain valid even in the dramatically changing industry landscape.

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Subject Index

D

E

F

G

H

P

R

S

T

U