Chapter 9 | overview

A contract is a legally binding, enforceable and reciprocal commitment governing the collaboration between two (or more) parties.

In this chapter the focus is on the development and execution of fit-for-purpose contractual arrangements between owner and contractor, characterised by an equitable allocation of risk. Such an arrangement needs to be robust; i.e. it needs to be effective throughout contract execution despite changes that will inevitably occur. The main streams in contract theory and their application in practice are discussed. The development of an optimal contracting strategy, breaking up the project work scope into contract packages, is considered in the light of owner capability. The main forms of remuneration and their application are described, together with the tendering and award process as well as subsequent contract management.

Throughout this chapter relevant terms and conditions are used to illustrate how the various concepts are formalised in the contract.

Chapter 9 | outline

Chapter 9
Contracting

by Kees Berends

9.1 | What constitutes a contract?

Contracts mean different things to different people. To a lawyer, a contract is a reciprocal commitment between two (or more) parties that is legally binding and enforceable; the contract defines the rights and obligations of the parties involved. In economic terms a contract is primarily a bilateral coordination arrangement that sets out how parties will work together. Here, contracting is discussed from a project management perspective, considering economic and legal aspects relevant to the practitioner, but with a focus on contracting as a tool to achieve effective project control. With this in mind, the following definition will be used:

> *A contract is a legally binding, enforceable and reciprocal commitment governing the collaboration between two (or more) parties.*

In project management the term **contracting** (contract, agreement) is often used for services (e.g. engineering, construction) and the term **procurement** (purchase order) is used for goods (e.g. bulk materials and equipment items). From a legal perspective however there is no distinction; they are contracts. Essential elements of contract formation are (Buchem-Spapens, 2011):
a) The intent to create a legal relationship and the legal capacity to act
b) An offer and an acceptance; and
c) Compliance with established practice and the law.

In economic transactions an underlying assumption is that a party's declared intent corresponds with the actual intent. This means that even in the case of an error by one party, a contract exists if the other party had good reasons to rely on that declaration. In principle all adults and 'legal entities' (e.g. corporations) have the capacity to enter into a contract, but the number of people authorised by a company to do so will be limited. If an unauthorised person has entered into a contract on behalf of a company, a contract will still exist if the other party had good reason to believe the signatory was authorised to represent the company.

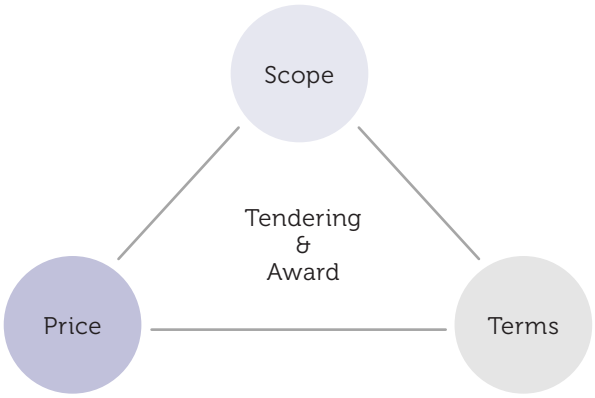


Figure 9.1: Contract triangle

The concept of offer and acceptance is at first sight simple and straightforward. In practice, however, complications arise on a regular basis. A statement can only be qualified as an **offer**, if it defines the following main elements: (i) Scope of work; (ii) Price and payment provisions; and (iii) Terms and Conditions. As illustrated in Figure 9.1, these elements are interrelated. In the contract a fit-for-purpose balance is established through an iterative process of qualifications and negotiation during the tendering and award process. An offer is revocable, unless explicitly defined otherwise; e.g. 'this offer is valid until ….'. The most important consequence of such an **irrevocable offer** is that the offering party cannot withdraw the offer during the specified period. An offer which is **free of engagement or without obligations** on the other hand, can be revoked by the offering party at any time. **Acceptance** is sometimes also complicated. For instance, it is quite common to 'accept the offer subject to the following qualifications …'. This constitutes a **counteroffer** rather than acceptance and the contract is not established until the counteroffer has been accepted without qualification. Finally it is worth mentioning that the moment at which the contract is established is not always obvious. Here the main rule is that the declaration of intent becomes effective upon reaching the party addressed. Whether or not it has come to the other party's attention is irrelevant (Dop, 2013). This illustrates that people are key in contracting procedures; e.g. if the letter in which the offer has been accepted has not been opened by the recipient, the contract has still been established.

The term 'offer' is typically used by lawyers whereas contracting professionals tend to speak of 'tender' or 'bid'. Here these terms are used interchangeably.

In principle, parties have freedom of contract which means they can stipulate anything they like in their contract, provided it does not contravene the law and it is feasible. A contract to build a perpetual motion machine for instance would not be possible. Contracts are only binding on the contracting parties and generally not subject to any format. This means they can be oral as well as written. Obviously, the main problem with oral contracts is that it can be hard to prove what exactly has been agreed. This is the main reason why contracts are usually written.

9.2 | Contract theory

9.2.1 Origins of contract theory

Contract parties are economic entities and consequently economists have taken a keen interest in analysing contracting through economic models. The starting point is the basic model of a business enterprise called the **theory of the firm**. Initially, the primary goal of the firm was thought to be (short-term) profit maximisation. Later on this was broadened to incorporate uncertainty and time. The behaviour of the firm in economic models is governed by **value maximisation**. The practical application of the initial models developed in the 1930s based on the theory of the firm, was limited due to the underlying restrictive assumptions such as a perfect equilibrium between prices and quantities at all times, parties being equally and completely informed, perfect verifiability by an external party (e.g. arbiter or judge). Within the context of this book, there is no room for a comprehensive review of the relevant economics literature however some of the most salient developments are outlined below.

In 1937, Coase was one of the first to introduce the concept of coordination mechanisms and cost. Building on this early work, in the 1970s Williamson developed the **transaction cost theory**, focusing on parties' inability to compose complete contracts in the face of (i) Incomplete and asymmetric information; and (ii) Limited enforceability due to independent arbiters not being able to verify contract performance reliably and in a timely fashion (Brousseau et al., 2002).

In recent decades, **game theory** has attracted a lot of attention. The most important event in its early development was the publication in 1944 of the book *Theory of games and economic behaviour* by Von Neumann and Morgenstern. In the early 1950s Nash developed the concept now known as the 'Nash equilibrium' and the game theory of bargaining, which proved to be an important building block. A famous early game, the 'prisoner's dilemma', was contrived by Dresher and Flood around the same time, involving two players where the self-interest of each player leads to both being worse off than if they had collaborated.

An important milestone in the development of **incentive theory**, which is such a large part of the contracting economics literature today, is the concept of moral hazard (from the insurance market) introduced by Arrow in the 1960s. This incorporates the notion that individual actions may damage the general welfare and cost to society as a whole (Macho-Stadler, 2001). In 1964, Scherer published his seminal paper on contractual incentives when the Department of Defence in the USA started to use these extensively (Scherer, 1964). In 1970, Akerlof described the hidden characteristic problem in the market for used cars. Owners of new cars often place these on the market when expensive repairs start to appear frequently; they are 'lemons'. Consequently the market for used cars contains a disproportionate number of lemons. This depresses the price of used cars, discourages good quality cars being put on the market, which decreases the equilibrium price and so on.

The theories described above focus entirely on material incentives and their impact on individual and corporate decisions. In the 1970s, Kahneman and Tversky introduced psychological research into economics, particularly regarding judgement and decision making under uncertainty, leading to what is currently known as **behavioural economics**. This builds on the work of Arrow, acknowledging that contracting is a human process where individual biases affect

corporate decision making. These biases include the representative heuristic (favouring salient data), availability heuristic (reference to examples) and the anchoring and adjustment heuristic (bias in favour of existing beliefs, initial estimates, etc.). These heuristics do not mean people are irrational but rather that their behaviour is governed by 'bounded rationality'. In most cases the available information is incomplete and the time for analysis limited, which impacts the decision making process at individual as well as corporate level.

An early example of operationalising economic theory is the work of Friedman on competitive bidding in the 1950s (Friedman, 1956). However despite the enormous advances in contracting economics during the last 40 years, the interaction between theorists and contracting practitioners remains limited. The latter tend to rely on best practices and standards based on operational experience as for instance described by Clough and Sears in their reference work which has been used in the industry for over 45 years (Clough et al., 2005). Fortunately, the value of an interdisciplinary approach, operationalising theoretical concepts from contracting economics is increasingly recognised (Berends, 2007).

9.2.2 The principal – agent model

The prevailing model in contract theory today is the 'principal-agent' paradigm, which draws on the theories discussed above. The principal (i.e. the owner) is the party that proposes the contract and the agent (i.e. the contractor) is the party that has to accept or reject the contract. The main concepts in the principal-agent model are:

a) Hidden information; and
b) Hidden action.

Hidden information and hidden action are frequently referred to as 'adverse selection' and 'moral hazard' respectively.

A **hidden information** problem exists when the contractor has characteristics or knowledge that are not known to the owner prior to contract award and that affect the contracting framework and contractor selection. This can relate to the financial status of a contractor, his workload or technical capability. The owner engages the contractor because the latter has technical capabilities and or resource capacity the owner does not possess. This inherently means that in many cases the owner does not have the competence or the capacity to carry out a comprehensive assessment. After issuing the invitation to make an offer (invitation to tender), but before acceptance (contract award) 'signalling' by the contractor may occur (e.g. the type and number of contract qualifications and the resourcing plan) revealing his hidden characteristics. It is important that the owner interprets these signals correctly, taking into account possible biases of the staff involved, to ensure the right contractor is selected.

Hidden action pertains to a situation where (i) The owner cannot verify whether the contractor has executed the work properly; or (ii) The contractor obtains certain relevant information **after contract award** without sharing this with the owner. On engineering and construction projects, the description of the scope of work will never be 'complete' and usually there are time constraints as well. Also the owner may not be able to assess the quality of the work in a timely fashion as certain defects may only become apparent after completion of the work or during operation. Also it may not be possible for a third party (e.g. arbiter or court) to verify the work in which case the contract will effectively be non-enforceable. In this context, it is important to realise that the interests of the contractor and the owner are different. For the owner, the project

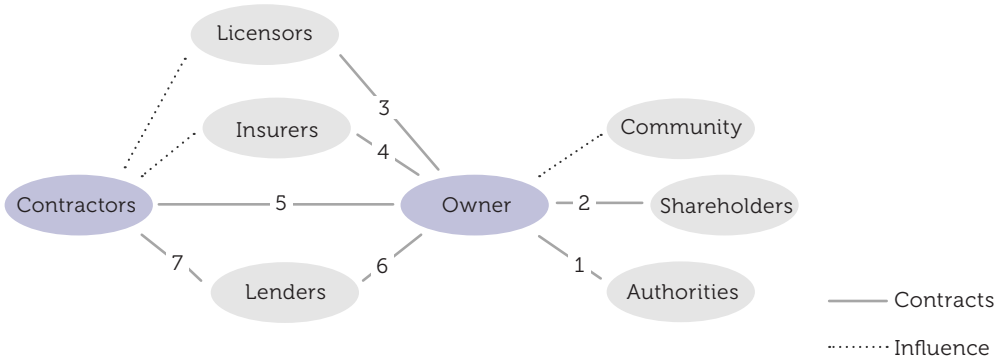
is a means to realise an asset that will generate revenue over a long period. The contractor's revenue is linked to the execution of the project. Consequently the bargaining (negotiating) position of the owner after contract award is in many cases weak as the consequences of poor quality and delays in completing the project are much bigger for the owner than for the contractor.

9.3 | The contracting framework

9.3.1 Contracting in context

Whilst a contract is only binding for the parties to the contract (i.e. owner and contractor), it exists and operates within a context of related contracts and stakeholders, as indicated in Figure 9.2.

The authorities play an important role through the applicable law, rules and regulations as well as requirements on participation of local companies, subsidies, etc. Non Governmental Organisations (NGOs) may also play a role. The interests of these stakeholders are in many cases (but not always) aligned with those of the local community. Their role pertains to the boundary conditions for project execution and early engagement with them is critical to project success. Insurers and lenders facilitate the execution of the project, they play a more direct role in the contractual relationship between owner and contractors (incl. licensors).



1 Legal requirements
2 Shareholders' agreement
3 License agreement
4 Construction All Risk (CAR) insurance
5 Engineering, Procurement and Construction (EPC) contracts
6 Loan agreement
7 Direct agreement

Figure 9.2: Contracting map

9.3.2 Liabilities and guarantees

On most projects the design depends to a certain extent upon information provided by the owner; this is commonly called **rely-upon-information**. The owner needs to identify those design elements for which it is responsible under the EPC contracts and to examine the recourse that it has to third parties (e.g. process licensors). It will also be important to address the question as to whether the design obligations of the contractor are absolute, like 'fitness for purpose' of

the asset, or less stringent like 'best endeavours in accordance with accepted industry standards' or the use of 'reasonable skill and care'.

The profitability of the project (and possibly the owner's ability to repay its loans) depends upon the facility fulfilling certain performance criteria. If the process technology is obtained from a third party licensor, the **license agreement** will stipulate: (i) Rights of the owner to use the technology for the project; (ii) Warranties of the licensor with respect to any patent infringement; and (iii) Performance guarantees with respect to the process technology. The performance guarantees will be subject to the plant being constructed in accordance with certain design specifications included in the license agreement. The liability of the licensor is typically related to a percentage shortfall in performance (e.g. production capacity) and is limited to a percentage of license fee.

In the event of physical defects or damage to the work, the contractor will be liable for compensatory damages to the owner. For an equitable contract, the contractor's liabilities should be related to the contract value; i.e. the revenue of the contractor and the risks associated with executing the work. Compensatory damages can be difficult to determine exactly and therefore, so-called **liquidated damages** may be included in certain contracts. These constitute a fixed amount per week's delay in completion and/or percentage shortfall in plant performance, that are payable by the contractor to the owner for damages suffered, up to a certain maximum. The word 'liquidated' in this instance merely signifies that the precise amount of the owner's damages has been established by agreement up front. Liquidated damages also are a way of limiting the liability of the contractor. It is normal to include an overall cap on the liability of the contractor and to limit the length of the defects liability period. **Consequential loss** (i.e. indirect losses such as loss of income or profit, loss of production, etc.) is in most cases excluded. An important exception to limiting liability are claims resulting from **gross negligence and wilful misconduct** of the contractor where it would be unjustified for the contractor to act in this way and then hide behind the limitation of liability in the contract.

The payment provisions in the EPC contracts may include **retentions** that the owner may hold back subject to completion of (part of) the work. The owner will wish to assess the adequacy of the **bank guarantees** or other bonds given by institutions on behalf of the contractor(s). Where the contractor is a subsidiary, the owner will often require a **parent company guarantee**.

Insurance is in many cases a key issue, particularly regarding deductibles. In case of project financing, the loan agreement will contain detailed requirements in relation to insurance and the lenders will usually wish the project insurances to be taken out by the owner rather than by the contractor. In the case of a major loss or damage, the lenders may also require a provision that insurance monies be available to repay the loan rather than continue with the project in the event of a substantial loss.

9.3.3 Financing the project

The structure of the project financing arrangement needs to be fit-for-purpose and may involve a number of different lenders with different lending terms and with different priorities in terms of access to the **security** provided by the owner. The risk analysis for the lenders is in many ways similar to that for the owner but their interests are not the same. The main difference is that the lenders' return is fixed. The lenders will generally not have an equity interest in the project and therefore will not benefit from the success of the project beyond their fixed return. On the

other hand, if the owner becomes insolvent, the lenders face a substantial loss and will have the administrative burden of enforcing and realising their security. Consequently, lenders tend to be more risk averse than the owner.

The lenders will first seek to ensure that each risk has been clearly accepted by one of the other stakeholders in the project. Secondly, the lenders will wish the risk borne by the owner to be minimised, although this may involve costs (e.g. insurance) that the owner considers to be uneconomic. Finally, where a risk is to be borne by another stakeholder (e.g. a contractor), the lenders will need to be satisfied that the stakeholder concerned has the resources to bear the additional cost which could arise if that risk materialises.

A key issue for the lenders will be the nature of the **security** given by the owner. Where the owner defaults on its repayment obligations, the lenders will wish to be able to take over the project and dispose of it to a third party. This will involve having appropriate security interests in all the assets and contracts of the owner, necessary to execute the project (and also sometimes over the shares of the owner).

The lenders will also want **direct agreements**, with the main parties contracting with the owner. Such direct agreements have become a standard requirement of lenders in project financing. The main purpose of these direct agreements is to ensure that if the lenders enforce their security, the project can continue either under the control of the lenders or, after disposal, under the control of a third party purchaser.

The **loan documentation** is likely to contain a large number of detailed obligations on the part of the owner in relation to project management. These provisions may include (i) An obligation not to alter the project contracts without the consent of the lenders; (ii) An obligation to enforce those contracts; and (iii) Rights for the lenders to monitor and inspect the status of the project. The shareholders of the owner may also be required to give certain undertakings. Breach of the undertakings may give rise to the right of the lenders to call a default, enforce their security and take over the project.

All in all, project financing will create significant contractual complications and it is important to consider possible implications at an early stage.

9.4 | Strategy development

9.4.1 Generic considerations

The contracting strategy defines the breakdown of the scope into contract packages and how these will be contracted out. Key elements in establishing this breakdown are:
a) Marketability and commerciality of the packages
b) Project management considerations; and
c) Project specific constraints.

Some parts of the scope may be contracted out through competitive tendering, in order to obtain offers (bids) at a commercially acceptable price. Here the availability of sufficient, competent

bidders is an important consideration. Other packages may be contracted out through (existing) frame agreements or single source negotiation. From a project management perspective, packaging scope elements can be attractive to minimise the number of interfaces. However the contractor responsible for a certain package may contract a large part to sub-contractors with the 'single point responsibility' and reduction of interfaces being a fallacy. Other considerations relate to construction sequencing, which will have an impact on the time when contracts for the various packages have to be placed. Project specific constraints may include the boundary conditions imposed by the various stakeholders (see also 9.3). To take all these considerations into account, it is essential to carry out a proper assessment of the requirements of all relevant stakeholders in a timely fashion. After generating a number of credible ways for a breakdown into contract packages (strategy options) the optimum strategy is selected based on certain criteria (derived from the overall project objectives).

9.4.2 Developing contracting strategy options

For the development of a contracting strategy, project activities are typically broken down into:

- Front End Engineering Design (FEED)
- Detailed design and engineering
- Procurement of materials and equipment
- Fabrication and construction; and
- Commissioning and start-up.

When generating options, it is useful to start with the two archetypes, described schematically below as strategy (a) and (b) and to subsequently develop a number of hybrids. The various options can be visualised in the form of a so-called 'contracting quilt'. In Figure 9.3, the contracting quilts of two archetypical contracting strategies are depicted, with a breakdown into five asset elements (general facilities, utilities, process plant 1/2 and storage tanks). The various blocks each represent a contract. In reality the breakdown will be more detailed and capital cost estimates for the various asset elements may be included to establish the size of the various packages.

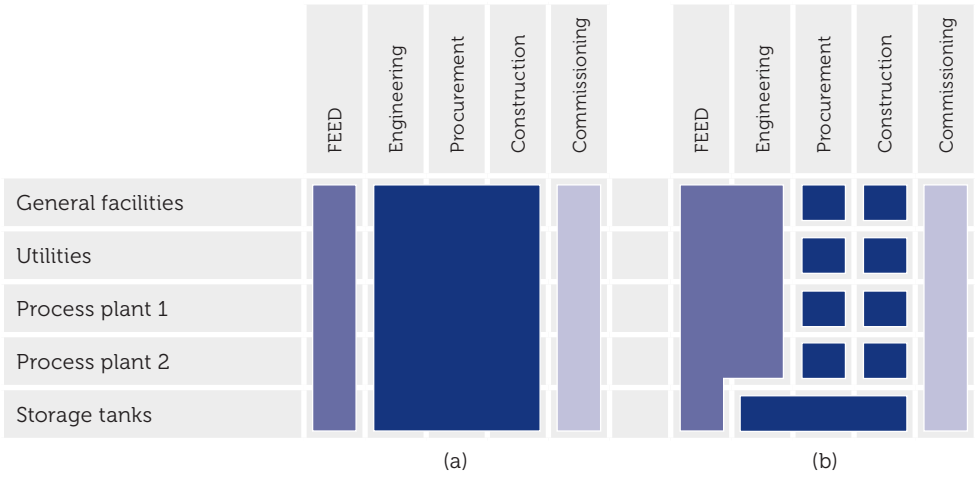


Figure 9.3: Strategy archetypes

Under **strategy (a)** the owner awards a contract for FEED and subsequently a contract for Engineering, Procurement and Construction (EPC). The contractor has an obligation to deliver the asset specified in the FEED package and in many cases the EPC contract will be on the basis of a lump sum / fixed price (see also 9.5). Commissioning and start-up activities are usually carried out by the owner, with assistance from the EPC contractor.

Strategy (a) inherently creates a hidden information problem. Whilst the contract sum is relatively small, FEED is critical for project success and therefore the owner will strive to select the most competent contractor. The latter will also want to participate in the execution phase (commercially the most interesting part of the project). Precluding the FEED contractor from participating in the tendering for execution may result in competent contractors being unwilling to perform FEED. On the other hand, allowing the FEED contractor to participate in competitive tendering for the EPC will provide them with an unfair information advantage versus the other bidders. Also, there is a risk of 'gaming' by the FEED contractor (i.e. manipulation of the FEED) to improve its commercial position during EPC tendering. This may even lead to a situation where other prospective bidders refuse to compete against the FEED contractor which participates in the tendering process, because they do not believe they have a realistic chance of winning. Hence the owner is at risk of finding itself at the end of FEED in a situation where strategy (a) is not marketable with no other option than to negotiate single source with the FEED contractor. A 'hostage' situation where the contractor, having just executed the FEED work, will in most cases be better informed about the project than the owner. This is particularly relevant in a constrained market, with ample prospective contracts for contractors. It is therefore critical to collect reliable market intelligence in a timely fashion. This may include pro-active engagement with the market and maintaining the established relationships during FEED by keeping prospective bidders informed about the status.

An alternative is to create a level playing field by having multiple contractors perform the FEED in parallel, with all contractors submitting a proposal for execution at the end of FEED. This minimises the risk of not having a competitive tendering situation for the EPC work but results in extra cost and an additional burden on the owner for managing multiple FEED processes.

Under **strategy (b)** the owner awards one contract for FEED and services for Engineering, Procurement and Construction Management (EPCM). As the FEED/EPCM contract is awarded at a time when the level of scope definition is limited, a reimbursable form of remuneration (see 9.5) will generally be used. Certain scope elements like storage tanks may still be contracted out on an EPC basis as they are executed by specialised companies, providing an integrated supply chain solution. Procurement of the other materials and equipment and construction activities is executed by the contractor 'for-and-on-behalf' of the owner. Effectively the contractor carries out the same activities as under strategy (a) but now at the owner's risk with subcontracts in the name of the owner. Strategy (b) potentially offers significant continuity and schedule benefits (with FEED rolling into detailed engineering), but requires a (relatively) large and competent owner's team, particularly regarding progress/cost control and contract management. A disadvantage for the owner is that it has to select a (main) contractor very early in the project lifecycle. However with EPCM services constituting only 10 - 20 % of total cost, the commercial exposure is generally limited.

The two strategies described above are archetypes and in practice many 'hybrid' forms will exist. As a variation of strategy (a), execution can be broken up into separate EPC contracts. This may be prudent to increase the marketability, but creates a coordination issue between the various packages. Similarly a variation of strategy (b), would be free issue of materials and equipment to a single construction contractor. This will facilitate a phased contracting approach, but it also means that the owner is responsible for (i) Timely completion of accurate construction drawings; and (ii) The quality and timely delivery of materials and equipment. Any problems in these areas will lead to claims of the construction contractor.

A concept that has received considerable attention during the last decades is 'partnering', where owner and contractor seek to create a collaborative relationship, based on trust between the parties rather than a formally structured arrangement; it is generally a non-binding process. Sometimes used interchangeably with partnering arrangements is the term 'alliances' which pertains to a construct whereby owner and contractor share risk and rewards. This is often realised through some form of incentive arrangement linked to target cost. In the domain of public procurements, Public Private Partnership (PPP) projects are gaining ground (e.g. Commissie Private Financiering van Infrastructuur (*Commission Private Financing of Infrastructure)*, 2008). This covers a variety of contracting frameworks that create a long-term relationship between the public and private sector, including private financing of public service or infrastructure projects.

9.4.3 Selecting a fit-for-purpose solution

The criteria for selecting the optimum strategy have to be fit-for-purpose and are generally derived from the overall project objectives; but they are not the same. Only those objectives that are influenced by the contracting strategy are relevant. As indicated above, schedule for instance is influenced by the contracting strategy and is therefore a selection criterion. Safety is not as this is not primarily driven by the contracting strategy.

Various techniques are available for selecting the optimum contracting strategy. A common approach is to carry out a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis. A more quantitative technique is the Analytical Hierarchy Process (AHP) described by Saaty (Saaty, 2001). A comprehensive description of decision-making techniques and processes is beyond the scope of this book. However, it is strongly recommended to follow a process with a balanced group of decision makers to avoid personal biases like the latest experience of the key project team members (see 9.2). This will involve professionals from project management, contracting, cost estimating/control, scheduling and selected technical disciplines.

9.5 | Forms of remuneration

9.5.1 The allocation and pricing of risk

The form of remuneration is an integral part of any contracting strategy, defining the pricing and allocation of risk. Under a contract, the contractor will have an obligation to: (i) Achieve a certain result (deliver an asset); or (ii) Use its best endeavours in providing services. The former is generally associated with a lump sum/fixed price and the latter with a cost reimbursable form of remuneration. For construction work so-called unit rate contracts are often used.

The main difference between these contracts lies in the allocation of risk and the time at which risk is 'priced'. With a lump sum/fixed price contract, the contractor is required to provide a price guarantee; i.e. the contractor is acting as a 'quasi-insurer' whilst in most cases it is ill placed to bear the consequences of risk materialising (Ward et al., 1995). With a reimbursable contract the owner initially carries the overall project (capital) cost risk and in the course of project implementation this is (gradually) transferred to suppliers and construction contractors (see Figure 9.4). Many different variations exist within these two groups. Here, only the ones most commonly used for FEED, EPC, EPCM and construction are discussed.

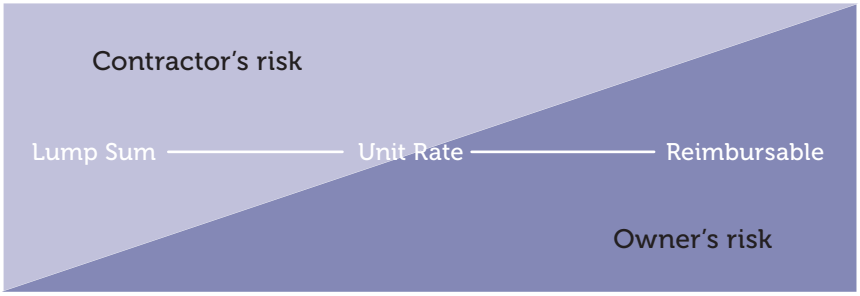


Figure 9.4: Forms of remuneration

9.5.2 Lump sum/Fixed price

With a **Lump Sum/Fixed Price (LSFP)** contract the contractor is responsible for executing and completing the work as defined in the scope of work for a fixed price; i.e. the contract sum is established at the start of the contract. The risk of the actual cost exceeding the contract sum is borne by the contractor. If the actual cost of the work exceeds the contract sum, the contractor has to accept a reduced profit or even a loss. This provides an inherent incentive for the contractor to execute the work efficiently. The premium associated with the contractor carrying the risk of cost and schedule escalation is included in the contract sum. The size of this risk premium is dependent on the contractor's assessment of the risks and on market conditions (i.e. competitive pressure).

Usually a reimbursable remuneration scheme is included for pricing any changes. LSFP contracts are generally used for EPC and construction work. Sometimes the term *turnkey* is also used, but this refers to a contract where the contractor provides a comprehensive service to owner (e.g. project financing, land purchase, EPC, commissioning and start-up); the remuneration basis does not have to be LSFP. Payment under an LSFP contracts is made against a series of milestones (based on completion of a certain event) and/or on a monthly basis against value of work done.

Table 9.1: LSFP/EPC Contracts

Strengths/Opportunities	
Relative cost certainty	Market feedback and commitment (in case of competitive tendering)
Simple arrangement	Single point of responsibility; contractor accepting the cost and completion risk
Performance incentive	Cost (inherently); schedule and plant performance through Liquidated Damages
Small owner's team	Progress monitoring and change management; limited executive decision points
Bankable	Preferred contractual arrangement for project financing
Weaknesses/Threats	
Scope definition	Good definition required, with limited 'rely-upon' items
Sufficient tenders	Approach only effective when sufficient credible tenders can be obtained
Risk premium	Contractor not well placed to bear the consequences of cost escalation
Schedule	Significant tendering period to enable risk pricing and FEED verification
Limited flexibility	Requirements need to be agreed at the start of contract

The strengths/opportunities and weaknesses/threats of LSFP/EPC contracts are summarised in Table 9.1. One of the main reasons why many owners prefer this approach is that it provides relative cost certainty (in the form of an LSFP/EPC bid) at the time of the investment decision. It should be noted that this certainty is not absolute, particularly on engineering and construction projects with a long project execution time and changing market conditions. Hence, the 'fixed price' under a lump sum contract may prove to be illusory if risks materialise and lead to change orders and claims. Also, many lump sum contracts nowadays contain exclusions or limitations of the contractor's liabilities, particularly with respect to risks that are beyond its control (e.g. wage increases, steel price, etc.) to limit the risk premium included in the contract sum.

9.5.3 Cost reimbursable contracts

A large number of different forms of cost reimbursable or **Cost Plus Fee (CPF)** contracts exist. All of them have in common that the owner reimburses the contractor for (i) All costs, reasonably incurred and directly associated with the project; plus (ii) A certain fee for the services provided. CPF contracts are typically used when the scope of work cannot be defined accurately upfront like FEED and EPCM services. The total contract sum remains unknown until completion of the work, because payment to the contractor is made on the basis of work actually done.

The strengths/opportunities and weaknesses/threats of CPF/EPCM contracts are summarised in Table 9.2. Differences between CPF contracts pertain to the way the fee is established. With a

Table 9.2: CPF/EPCM Contracts

Strengths/Opportunities	
Marketability	Service contracts are attractive when project risks are high
Risk allocation	Risks allocated to the party best placed to carry the risk Optimum timing of contract award, when work packages are defined
Lowest cost	Limited risk premium
Continuity	Continuity between FEED and detailed design and engineering
Flexibility	Changes during execution can easily be accommodated
Weaknesses/Threats	
Cost uncertainty	No overall 'fixed' contract sum at the investment decision
Performance incentive	No inherent performance incentive
Complex arrangement	Extensive control required by the owner
Bankability	Additional guarantees from the owner may be required

Cost Plus Percentage Fee (CPPF) contract the fee is calculated as a percentage of the man-hour cost of the EPCM services. This can also take the form of an all-inclusive hourly rate. A major disadvantage of a CPPF contract is that it effectively provides an incentive for the contractor to increase the overall project scope, as the amount of services (and the contractor's profit in absolute terms) is related to the overall scope. This requires extensive owner involvement to control. An alternative is a **Cost Plus Fixed Fee (CPFF)** contract whereby a single, fixed fee is agreed for all services. This means that when the number of service hours increases, the contractor's profit margin (i.e. fee divided by the service hour cost) decreases, which discourages it from unduly inflating the number of hours. Another alternative is to make the fee (in part) subject to performance against a number of criteria defined at the start through a **Cost Plus Incentive Fee (CPIF)** contract. This can indeed provide a mechanism to align the interest of owner and contractor through the contractual arrangement. In practice however, it is often difficult to define criteria and set performance targets that are meaningful and robust. Many incentive schemes are 'over-engineered'. Whilst they have a place in the toolkit of the contracting professional, they are generally only used on large projects and after careful analysis and modelling of the fee potential versus the expected outcome of the criteria.

An inherent problem with CPFF and CPIF contracts is that the actual cost and fee (profit) for the services have to be separated. This is in many cases not easy and requires specific financial (owner) competencies to establish whether the cost build-up (salaries, payroll burden and overheads) is fair and reasonable.

9.5.4 Unit rate or bill of quantities

Unit rate contracts are typically used for construction work. The units used (e.g. in a tunnelling contract: a cubic meter of material excavated or a meter of tunnelling completed) and prices are specified in a schedule of unit rates or 'bill of quantities'. Unit rate contracts can be used when the overall scope of work is unknown at the time of contract award, but the scope of each unit can be defined. Therefore they require less scope definition at the outset than lump sum contracts, although a reasonable estimate (by the owner) of the quantities is important for having an effective tendering process. With a unit rate contract, the contractor carries the 'productivity risk' of executing the work as the owner is paying a fixed price for each unit. The owner carries the risk of the quantity of work and must ensure it has the resources to carry out measurement of the actual quantities executed. Tendering of unit rate contracts requires a significant effort from both owner and contractor and is therefore only used on large projects or an existing production site where it can be applied for a number of smaller projects and maintenance work.

9.6 | Sourcing and contract management

9.6.1 Prospective contractors

The sourcing process requires a significant effort from contractors and the associated transaction costs have to be recovered at some point in the supply chain. Therefore it is good practice for owners to follow a staged process which ensures that contractors do not incur unnecessary costs in pursuing opportunities which they have no chance of winning. In general terms, the owner also has an obligation to be clear about its intentions during the contracting process, and failure to do so will provide the contractor with recourse under law even if the contract has not been concluded.

The first step in contractor selection is establishing a 'long list' of contractors that could potentially carry out the work. Potential contractors will be requested to indicate whether they wish to participate in the project; the **solicitation of interest**. This is followed by a **pre-qualification** process leading to a 'short list' of potential bidders that will receive an Invitation To Tender (ITT). Whereas the number of contractors on the 'long list' and the 'short list' will depend very much on the work at hand, generally these should be 5 - 10 and 3 - 5 contractors respectively. The purpose of the pre-qualification process is to establish whether prospective contractors are suitable to execute the work, with respect to:

a) Financial health
b) General management and
c) Technical competence.

Contractors will be requested to submit general (e.g. financial data), as well as project specific information (e.g. track record for this type of work, safety performance). The contracting strategy will also have to be taken into account. For instance if the work pertains to FEED but the intention is to 'roll on' into EPCM, competences for both have to be considered. The information under a) and b) is mostly generic and may not be required if the owner frequently does business with certain contractors.

To preserve the integrity of the pre-qualification process, it is important to establish the evaluation procedure prior to receipt of submissions. This procedure should define the selection criteria, the process (avoiding undue bias), the responsibilities of the members of the evaluation team, 'checks-and-balances', timing and a communication protocol. It is acceptable to request clarification during the pre-qualification process in the case of ambiguity or missing items, provided a level playing field is maintained. Also, it is good practice for the owner to provide (general) feedback to those contractors that have not been 'shortlisted'.

9.6.2 The tendering and award process

As a general rule, the ITT compiled by the owner should be suitable for incorporation into the final contract with minimum alteration. An ITT typically consists of the following main elements:

- Scope of work
- Admin instructions and
- Draft terms and conditions.

The **scope of work** describes the deliverable as well as the way the work will be executed and the timing. For a FEED contract this will include the initial basis of design, standards, the level of detail required, special studies, calculations and simulations, etc. In the case of an EPCM contract, requirements regarding project execution (including monitoring, control and reporting) should be specified as well. For an EPC contract or a construction contract, a FEED package, technical specification and construction drawings (when available) will be included. Some of this information may be 'rely upon Information' or information from licensors (see 9.3.2).

The **admin instructions** specify how the tendering process will be executed; management of the information flow, clarification meetings, the format of the tender and the submission time. The tender may be split into a technical proposal and a commercial proposal. The technical proposal contains the deliverables and how the work will be performed. The commercial proposal contains any qualifications to the draft contract included in the ITT and the pricing information. It is recommended to evaluate them separately to avoid bias.

Included in the ITT are the **terms and conditions** proposed by the owner to provide a common basis of the commercial proposals submitted by the bidders (see also 9.1). The so-called 'battle of the forms' should be avoided, i.e. bidders responding by submitting their own (different) terms and conditions, as this leads to inefficiencies and difficulties regarding equalising the bids. Included in the terms and conditions are the payment provisions; the time value of money has to be considered for any alternatives proposed.

During the tendering period, bidders may be offered the opportunity to visit the site and the owner will have to manage the process of clarifications, ensuring all bidders receive the same information to maintain a level playing field. It is important to allow for sufficient time for bid preparation; not doing so will have a detrimental effect on the quality of the bids and inevitably lead to delays and cost escalation later on.

The bid evaluation process is in many ways similar to the pre-qualification process but the integrity issues are more pronounced and the procedures for handling information more strict. Also the owner will generally as part of the process compile a **counter estimate** prior to opening the bids.

After the bid evaluation has been completed, negotiation will start with the 'preferred bidder' to finalise the contract. It is critical that during this period of negotiation the other bids remain valid, so the owner retains a fall-back position should it not be able to reach conclusion with the preferred bidder. For major contracts it is customary to jointly sign the contract upon conclusion of the negotiations to avoid ambiguity regarding the time at which the contract is concluded (see also 9.1).

9.6.3 Contract management

Starting with the tender and the signed contract, contract execution generates a lot of information and documentation. Clear procedures and an efficient **contract administration** system are essential for a fit-for-purpose contract management process. The contract management procedures will define the division of work and responsibilities between contract holder (i.e. the person responsible for executing the work), contracting and procurement, finance (e.g. invoicing and payments) and other stakeholders such as the legal department, tax, etc. The administration system is used to store all relevant documentation and to assist in managing the information flow. Many commercially available software packages exist ranging from simple database solutions to advanced, integrated and interactive systems (accessible by owner and contractor) for all contract correspondence (i.e. no communication via Email anymore). It is important however to recognise that the operation of such a sophisticated system requires serious expertise and alignment with other IT systems at the owner's organisation.

An important element of contract management is **performance monitoring**. In many cases this will be limited to progress and cost control, but for a large contract other performance indicators may be established that are tracked on a regular basis (e.g. regarding safety performance). As part of the payment conditions, the contract may include an advance payment, made at the beginning of construction to assist the contractor with the start-up costs. Payment during contract execution can be through **progress payments, milestone payments** or a combination thereof. These need to be in line with the 'value of work done' and milestone events completed in the field and the contract will contain provisions allowing the owner to hold back payment in cases of progress falling behind.

The area that requires specific attention – as it is often underestimated – is materials management and logistics. This includes expediting, inspection and warehousing of materials and equipment during construction as well as timely ordering of spare parts and handover to operations.

A **change order or variation order** occurs when during contract execution the owner requires a change in the scope of work or if other changes occur for which the contractor is not liable under the contract. For instance, certain technical issues, exchange rate fluctuations, increases in labour rates, etc. may have been explicitly excluded. If it is not clear whether the contractor is liable for the latter, the parties need to establish whether (i) The contractor could reasonably have foreseen these changes or whether these should be considered as an inherent contractual risk; or (ii) The contractor is entitled to a change/variation order. If the owner and contractor cannot resolve the issue at working level, the issue is first referred to senior management of the parties. If the issue still cannot be resolved, the contract will provide for the means of resolving what has now become a **dispute**. This can be a form of **mediation**, a negotiation process facilitated by an independent party, focusing on the commercial interests of the parties and not their legal rights.

Another private dispute resolution process is **arbitration**, but it differs in that it produces a binding result which is immediately enforceable. Finally, disputes can be resolved through **litigation**, which comprises a public process.

Concluding observations

It is sometimes stated that contracting strategies and lump sum/fixed price forms of remuneration (combined with competitive tendering) lead to a confrontational approach between owner and contractor. Approaches based on a form of reimbursable contracts, on the other hand are often believed to be more conducive to collaborative contracting. It is indeed true that in many cases in the relationship between owner and contractor, both parties pursue their individual interests rather than working together to maximise the overall value of the project. This manifestation of the 'prisoner's dilemma' is however mostly caused by ineffective transmission of information rather than the contracting strategy or the form of remuneration (see 9.2).

It is important for both owner and contractor to be clear about their expectations and to acknowledge their different roles. The owner's objectives are centred around the creation of the asset (taking into account the various project stakeholders) whereas the contractor's focus is on realising value by executing the project. **Alignment of objectives and collaborative contracting is possible through various contracting strategies and forms of remuneration**. The purpose of the sourcing and contract management process is to clarify the parties' intentions; translating these into a contract is an outcome rather than an objective.

It is important for owner and contractor to get off on the right footing, building a constructive relationship between key staff members based on trust and maintaining this relationship during contract execution. By definition a project constitutes a change management process and during its lifecycle the scope as well as the business environment (e.g. supply chain) changes. The owner has to be realistic about what can be achieved during the various phases in the project lifecycle and the contractual arrangement has to be robust with respect to accommodating these changes. Also, it is critical that the owner has the competence required to identify and interpret signals from the contractor. Both owner and contractor have a lot to gain by working together effectively. Failing to do so comes at a high price and cannot be mitigated by 'contractual fixes' like increasing penalties and guarantees or monetary incentives.

9.7 | The Wind Farm

A key consideration in establishing the contracting strategy is that Participants Windenergy Vento (the owner) lacks the expertise required in realising the project and therefore it is looking to enter into a turnkey contract for execution. With project development being dependent on the technology (and key equipment) used, Participants Windenergy Vento may end up in a captive situation versus Allwind Energy. Taking this into account, the following contracting strategy options can be identified:

a) Alliance
Participants Windenergy Vento and Allwind Energy enter into an (reimbursable) alliance agreement, covering project development, execution, operation and maintenance. The alliance agreement will include a performance based (incentive) fee to align parties' objectives. If at the end of project development a (lump sum / fixed price) turnkey contract cannot be agreed, the alliance will continue on a reimbursable ('open book') basis.

b) Project Management Contractor (PMC)
During project development, the PMC will work together with Allwind Energy and (lump sum / fixed price) contracts will be concluded for the license and supply of turbines. If a turnkey contract cannot be agreed at the end of project development, the PMC will manage project execution, contracting out the separate scope elements, with an operator being resourced during execution.

Strategy (b) has the disadvantage that it creates an additional management layer. The PMC can contract out and manage certain scope elements (e.g. foundations for near-shore turbines). However, the dependency on Allwind Energy will remain with the supply of turbines being a large part of the scope. Strategy (a) provides good opportunities for collaborative contracting, but a comprehensive and robust alliance agreement will be complex. In view of the above, a variation of strategy (a) is recommended, with the owner engaging a specialist consultant to set up the alliance agreement and to provide advice during the initial phases.