Abstract

Engineering, procurement and construction (EPC) contracts are on the way to become the most usual form of contracting applied by the private sector to undertake construction works on large scale infrastructure projects. In every project, it is necessary to have good contract management in place; otherwise it can have negative consequences for all parties involved – the client, contractor, lenders, government, etc. If contract management is not implemented and controlled properly, it may have a negative impact on the project as a whole. Such failures may include a delayed schedule, cost overruns, quality, safety and more. Nowadays, some contractors refuse to enter into EPC contracts in certain jurisdictions, since a number of contractors suffered from heavy losses in the past. A qualitative approach was applied in order to analyze the critical points of contracts based upon reviews of related case studies from the power sector and supplementary interviews with business professionals. This research study identifies the key clauses and pitfalls causing the majority of disputes in EPC contracts and provides the description of these conditions in order to increase their common understanding. In addition to that, the key factors of successful project completion under the EPC contract scheme were defined. It was also found that the EPC contracting scheme could work very well for power projects, especially in the cases where the contractor is in a good position to understand all legal aspects of the contract, including the allocation of risks.

Keywords: Contract Management; EPC Contracts; International Construction; Power Sector.

1. Introduction

This paper concerns EPC contracting and its application in international power projects. An EPC contract typically covers project management, site management and supervision, engineering, materials and equipment, civil works, foundation and site infrastructure works, transport and installation, and commissioning, as well as scheduling and performance guarantees for the entire solution. The client typically takes care of the plant permits, electrical interconnections, and fuel supply arrangements. Site preparation (site clearing, leveling, etc.) is often part of the customer’s scope.

Recently, contractors have become more averse. This is primarily because a turnkey solution is not as simple as it sounds, due to the inevitable complexities of large power projects and the decreased contractors’ risk appetite in the global project arena. When negotiating contracts, they are seeking exclusions from and significant caps on liability...
when negotiating contracts. Contractors thus demonstrate their tendency to prefer the projects where they need to carry the least risk and gain most profit. Similarly, clients look for contracting strategies in order to transfer all the risks to the contractor and decrease the project price at the same time. Despite the growth of other types of contracting forms, the authors believe that EPC contracts will further play a predominant role in large infrastructure projects in most jurisdictions.

The diagram below illustrates the basic contractual structure of a project-financed power project using an EPC contract, while, on the other hand, a detailed structure can vary from project to project.

![Diagram of basic contractual structure using EPC contract](image)

Figure 1. Basic contractual structure using EPC contract [5]

2. Research methodology

For the purposes of this research, a qualitative approach was selected as an interpretative technique of data collection in order to increase the understanding of the topic. This methodology describes, translates, and otherwise comes to terms with the meaning of certain phenomena [4]. The authors reviewed four case studies of delivering power plants under the EPC scheme in the Czech Republic, the Russian Federation and the Sultanate of Oman. Academic literature and case studies were the main sources of data. In order to get a wide context and support for our arguments, 13 supplementary interviews with owners, legal professionals and executives representing EPC contractors were conducted.

3. Literature survey

There are several studies dealing with standard conditions of EPC contracts. Bakr et al.[1] proposed a structured risk management process in order to assess various risks in the EPC contract environment. The study came to the conclusion that projects that used the structured risk assessment process would have a better chance of meeting financial, schedule, and other stakeholders’ expectations. Another study [3] identifies typical construction risks and describes the comparison between FIDIC and the Taiwanese government conditions of contracting for hydropower construction projects. However, there are various interpretations of the risk allocation between owners and contractors. According to the study conducted by Wang and Chou [14], many disagreements may result from the absence of related contract clauses, unclear stipulations, or queries about the fairness of risk allocation. There are also several studies examining time disputes in construction contracts. Iyer [8] has identified the critical clauses that lead to disputes in construction contracts through extensive case study research. The study came to the conclusion that the following clauses were causing the vast majority of disputes:
• Final and binding power
• Time, delay and extension
• Termination of a contract
• Pricing of deviations and extra items
• Deviation limit/scope of work
• Price escalation

Thompson and Portis [13] discussed construction law of the United States of America; the authors observed that the literature and case laws are difficult to reconcile, engineers and non-legal professionals can hardly foresee the outcomes of court proceedings. On the other hand, several studies demonstrating the consistency of law in several cases were conducted, such as disputes regarding disputes on the interpretation of clauses [12], disputes on specifications [10] and disputes on certifying completion [11]. Branconi et al. [2] conducted research on contracting large projects and introduced eight business levers in a contract.

4. Turnkey contracting

The main idea standing behind the EPC approach for the contractor is to be given the job to engineer, procure and construct the required works. Once these works are finished and the facility is ready to operate properly, the plant is handed over to the owner so that he may operate it himself.

Project financed deals are typical of revenue generating facilities and thus also power plants. A feature of the turnkey approach to contracting is the requirement for the contractor to prove the reliability and the performance of the power plant. Thus, during the turnkey contract drafting, particular attention is given to facility testing, commissioning, instruction and continuous plant handover. This is a typical procedure for all power generating and other process engineering projects. The essential importance in these projects is not only to be delivered in time, within agreed costs, but predominantly to be capable of meeting the designed production capacity. The performance of the facility is particularly of key importance in those turnkey projects which are mostly funded under the project financing scheme. Also, the security of lenders is directly dependent on the ability of the constructed plant to operate properly and generate revenues. All these key aspects are reflected in general conditions of the FIDIC Silver Book. The Time for the Completion of works includes not simply completing the works so that the owner can take them over, but also achieving the passing of the Tests on Completion [6].
5. Contracting strategy

When embarking on a major capital project, the investor must select a basic strategy for the contracting of the project. Various approaches exist and, for good reasons, the choice of the contracting approach could affect the outcome of the project. In terms of the contract price, there are two main approaches:

- Turnkey EPC with a fixed price
- Turnkey EPC with a target price

This topic was the subject of extensive research conducted by Gloria et al. [7]. The authors came to the conclusion that the Turnkey Fixed-Price approach was better utilized when a substantial amount of up-front engineering work had already been performed. This study also stressed that preliminary engineering is required to clearly define the contractor’s scope of work, since a poorly defined scope for a large project will definitely have consequences that affect all risk categories.

The contractor bears most of the project-related risk under the EPC contract scheme and thus controls the quality of purchased materials and technologies installed, unlike the facility owner who only has limited possibilities to monitor that. In the view of the fixed-price contracting scheme, the contractor is usually not motivated to purchase more expensive materials than necessary in order to reach savings with a positive impact on the contractor’s profitability. Under the EPC contracting scheme, by using the target price the contractor is motivated to control the contract price in the owner’s favor compared to the fixed price-based contract. The target price is usually recommended for projects where the scope of work is not exactly known or defined. Such a contracting concept requires a significant level of mutual trust among the contracting parties to make sure that potential disputes will be resolved without harming their contractual relationship and having a negative influence on the project execution.

6. Disputes

Disputes mostly arise out of time delay, quality or cost overruns. The contract defines the obligations of parties to meet the project performance, including the time schedule, similarly as the recourse in the event of failing to meet the agreed obligations. The areas of disputes in connection with EPC projects may further include: scope of work definition and interface; verification; change of orders and notices; schedule delays and disruptions and associated schedule liquidated damages; warranties; terminations for default and convenience, force majeure or unfair calling of guarantees. One of the key disputes is lurking in the unclear specification or misunderstanding of contractor’s liability towards the client under the contract. In order to avoid claims regarding the plant functioning and to determine the economic performance of the technology installed, a clear definition of key preconditions and parameters to be measured is strongly recommended.

7. Key Clauses of EPC Contracts

The key clauses in any construction contract are the ones affecting time, cost and quality similarly as in EPC contracts. However, EPC contracts tend to deal with issues with greater sophistication than other types of construction contracts. This is because an EPC contract is designed to satisfy the lenders’ requirements for contract’s bankability [5]. Some contract clauses are repeatedly the source of disputes between the owner and the contractor. Several respondents repeatedly stressed that the shortage of contract management on both sides could lead to a poor understanding of contract’s conditions and consequently to disputes related to bearing the responsibility for and the coverage of unexpected costs. Contractors can thus accept the risks of which they are not fully aware. All respondents clearly stated that the necessary precondition for a successful functioning of the EPC approach was the contractors’ position to understand, manage and have an influence on the risk allocation as well as contractors’ readiness to assume the level of risk. In response to reviews of 4 case studies dealing with power projects delivered under the EPC contracting scheme, the major risk bearing contract aspects were identified. These were consequently related to transparent and widely recognized contract clauses defined in the FIDIC Silver Book.
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<tr>
<th>Aspect/Issue</th>
<th>Description of conditions</th>
<th>Related Article in FIDIC</th>
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| Single point of responsibility   | • The Contractor is responsible for all design, engineering, procurement, construction, commissioning and testing activities  
• If the EPC Contractor is based on a joint venture, the responsibility is joint                                                                 | Silver Book Arts. 4.1 and 5                                                               |
| Fixed contract price             | • Very limited options for the Contractor to claim extra time/costs  
• In general limited to directed variations to works                                                                                                       | Silver Book Arts. 13.1, 14.1 and 20                                                     |
| Fixed completion date            | • Date of completion is guaranteed  
• Failure to meet the completion date will attract liquidated damages (LDs); in order for these to be enforceable there has to be a genuine estimate of the loss to be covered by the project company if the completion date is not met | Silver Book Arts. 8.2, 13 and 20                                                       |
| Performance guarantees           | • Project company's revenue will be generated by the project revenue  
• It is crucial that the facility performs in respect of output, efficiency and reliability. This is the purpose of Performance LDs payable by the Contractor in the case performance requirements are not fully met | There is no related article for Performance LDs, see e.g. Art. 9.4.                   |
| Caps on liability                | • EPC Contractors will mostly be against unlimited liability  
• Usually capped at 100% of the Contract Price  
• Sub-caps of 20% of the Contract Price on delay  
• Performance LDs are also usual  
• Consequential damages are also generally excluded  
• There can be some exceptions to these caps (willful misconduct, breach of patent rights) | Silver Book Art. 17.6                                                                  |
| Security                         | • The EPC Contract will require that performance security be delivered by the Contractor in view of its obligations under the EPC Contract  
• Market security contains the following:  
- Bank guarantee for 5-15% of the Contract Price  
- Retention of 5-15% of each payment under the EPC contract  
- Advance Payment Guarantee  
- Guarantee issued by the Parent Company – in order to secure Contractor's performance                                                                 | Silver Book Art. 4.2                                                                   |
| Defects liability                | • Contractors are required to repair defects within 12-24 months following the completion of performance testing                                                                                                      | Silver Book Art. 11                                                                    |
| Intellectual property            | • The Contractor has to guarantee it has the rights regarding all patents and proposed solutions. Very often, there is also an indemnity for breach                                                                 | Silver Book Art. 17.5                                                                  |
| Force Majeure                    | • Parties are excused from performance in the case of certain Force Majeure events (war, strike, riots, earthquake…)                                                                                                   | Silver Book Art. 19                                                                   |
| Suspension                       | • The project company has suspension rights                                                                                                                                                                | Silver Book Arts. 8.8 to 8.12                                                        |
| Termination                      | • The Contractor has limited termination rights (non-payment, extended suspension, contract breach by the employer)  
• The project company has much broader termination rights. This will be tied with third party agreements - termination for convenience or termination for breach | Silver Book Art. 16.2, 15.2, 15.5                                                     |
8. Conclusion

With the increasing size and complexity in the nature of projects, the conditions of construction contracts also tend to become more complicated, which consequently contributes to an increase in the number of disputes in addition to the existing ones. Due to their wide recognition, standardized contract forms can eliminate the number and frequency of claims besides time and cost overruns. According to examined case studies, the experience and observations of interviewed persons, the EPC contracting scheme can work very well, especially where the EPC contractor is familiar with all contract details and is fully aware of possible risks resulting from risk-related contract clauses. Contractor’s past experience with EPC contracting was also deemed as a substantial precondition for a successful project delivery. In cases where the contractor is not ready to accept the level of risk resulting from the EPC contract, which is the frequently observed phenomenon in the construction market, alternative contracting schemes such as a strategic alliance or a multi-contracting approach might be taken into consideration.

Based on the review of related case studies and supplementary interviews with business professionals, we have identified the following key factors of a successful project execution under the EPC contract scheme:

- Application of standardized forms of the EPC contract
- Awareness of the EPC contractor about the extent of responsibility and risk he bears
- Good contract management in place
- Detailed knowledge and understanding of a contract

Acknowledgements

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References

[5] DLA Piper (2011). EPC Contracts in the Power Sector, Asia Pacific Projects Update, 4-5,

Further readings