Application of Convertible Contracts in Oil and Gas Projects

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Abstract

The predictability of the current oil and gas projects has been significantly reduced by increasing the technical complexity as well as overlapping project phases. Accordingly, project participants are exposed to more risks and uncertainties which should be allocated between them appropriately. Contract is a mechanism to allocate the project risks between contracting parties. Commonly used conventional forms of contracts in oil and gas projects such as Cost Reimbursable and Fixed Price (Lump Sum) inequitably shift the project risks to the owner or the contractor. In recent years and mostly in the Middle East, a convertible contractual framework has been used in some oil and gas projects to address the needs for overlapping project phases and optimize the risk balance between contracting parties. However, critical issues of implementing convertible contracts such as the time of conversion and conversion mechanism have not been addressed in previous studies. This paper illustrates the execution and conversion processes of the convertible contract as an appropriate contracting strategy in oil and gas projects.

1. Introduction

Engineering, Procurement, and Construction (EPC) is widely used as an execution strategy in oil and gas projects in which an EPC contractor is responsible to deliver the complete facility to the owner. In response to the vast fluctuations in the oil and gas market and with respect to the importance of the early return of investment, most EPC projects are performed in a fast-track mode to accelerate the project schedule and start early operation. Fast-tracking is used to reduce the overall project duration by overlapping project phases or activities. However, starting an activity or a project phase without complete data and information creates more risks and uncertainties than normal execution. Consequently, contracting parties are exposed to more risks which should be assigned to them appropriately through an effective contracting strategy.
Cost reimbursable contract has been frequently used in Canadian oil and gas industry. However, in this contractual scheme, the owner is not certain about the overall cost of project completion and the contractor is not well motivated to cut the project costs. As a result, owners prefer to perform projects on a lump sum basis. Conversely, contractors are reluctant to participate in EPC projects under a lump sum contract because this arrangement shifts the risks of cost overruns and project performance to the contractor. In this tight economic atmosphere with high level of risks and unpredictability, project stakeholders fight harder for more benefits, which results in tough contract language and conditions (Grynbaum, 2004).

In recent years and mostly in the Middle East, a different contractual framework has been used in some EPC oil and gas projects to address the needs for fast-tracking and optimize the risk balance between contracting parties (Brkic and Romani, 2009). In this arrangement, Convertible contract, the contract starts under a cost reimbursable scheme when the project definition is incomplete and once the scope of work is well defined, the contract will be converted to a lump sum contract. Still, very few studies in the literature have pointed out characteristics and implementation of convertible lump sum contracts. Significant elements of a convertible contract including the time of conversion and conversion mechanism are discussed in this paper.

2. Oil and Gas Projects

An overview of the typical project life cycle, execution strategies, and the general contractual structure provides a better understanding of the main characteristics of oil and gas projects.

2.1. Typical life cycle in oil and gas projects

Figure1 illustrates five main phases of a typical life cycle in oil and gas projects.

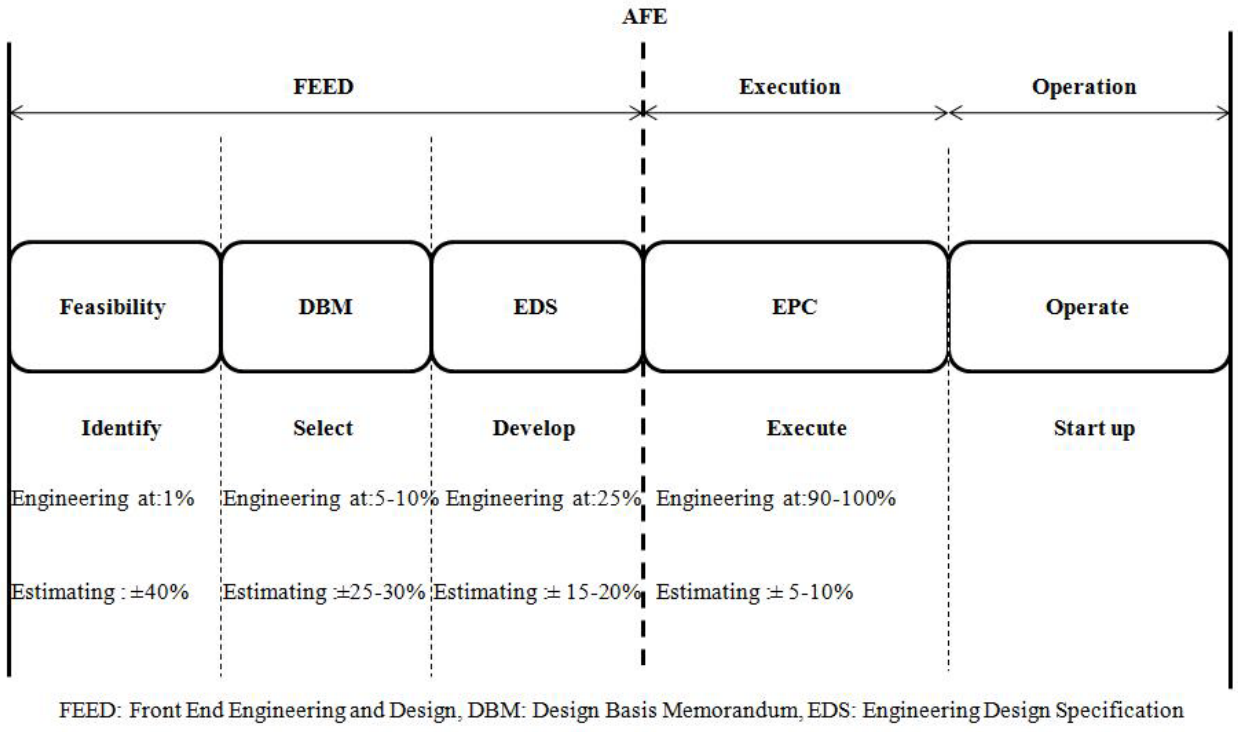

Figure 1: The typical life cycle of oil and gas projects

The main focus of the first three phases, called Front End Engineering Design (FEED), is on project feasibility, conceptual, and basic design before starting the execution of the project. The main products at the end of third phase are basic design or Engineering Design Specification (EDS) package and Approval for Expenditure (AFE). AFE is a document which officially approves budgeting for executing the project. The fourth phase or execution, including engineering, procurement, and construction activities, is usually performed by an EPC contractor. The basic design package is the basis of bidding for EPC contract in oil and gas projects. The EPC contractor may be directly responsible for performing all the required work or

subcontracts most or parts of the work to subcontractors. In both cases, the EPC contractor is in charge to the project performance and obliged to deliver the whole facility to the owner (Musselli and Zarrilli, 2005). Figure 2 shows the simple contractual structure when the EPC contractor has a single contract with the owner and several contracts with various subcontractors and suppliers.

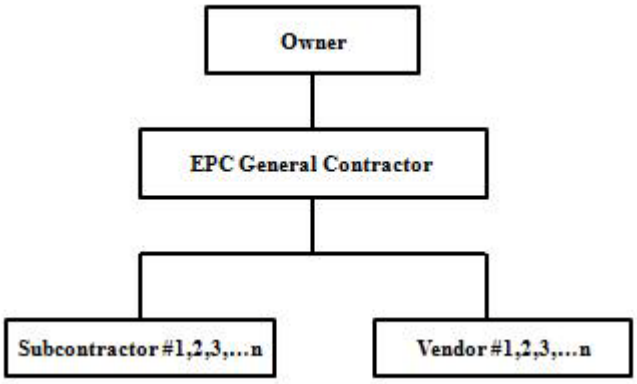

Figure 2: The general contractual structure in an EPC oil and gas project

2.2. Execution strategies

In a normal execution process, engineering, procurement, and construction phases of the project are almost performed sequentially. However, in order to accelerate the project schedule and start early operation, most of EPC oil and gas projects are performed in fast-track mode by overlapping engineering, procurement, and construction phases. Figure 3 compares normal and fast-track execution process in EPC oil and gas projects.

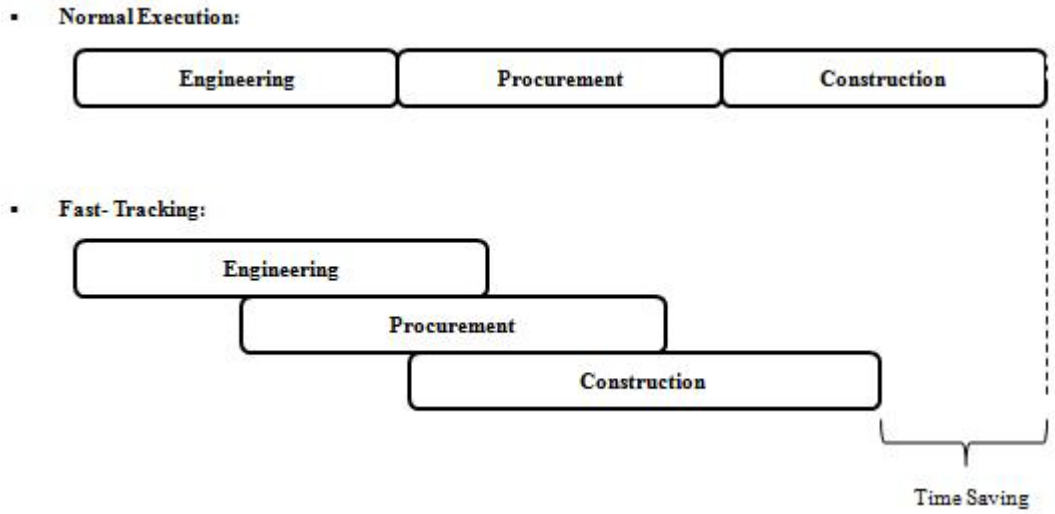

Figure 3: The execution strategies in EPC oil and gas projects

Although more overlapping affords more reduction in project duration, it usually results in higher level of risks and uncertainties in project outcomes. Cost overrun, design errors and omissions, delay damages, change orders, construction rework and overlooked work are most

common risks in fast-track projects (Moazzami et al., 2010). Although these problems are not specific to fast-tracking, their frequency is relatively higher in this approach.

3. Conventional Contract Types

Contracts are mainly distinguished by the contract price arrangement and generally fall into one of the three main categories: Fixed Price, Cost Reimbursable, and Guaranteed Maximum Price Contracts (Fisk and Reynolds, 2006).

3.1. Fixed Price Contracts

Lump sum and unit price are two major variations of fixed price contracts.

- **Lump Sum or Stipulated Price:** Under a lump sum contract, the contractor is obliged to perform the whole project work on a stipulated price basis and assume most of the project risks and liabilities. The main advantage of this approach is to know the ultimate time and cost required to complete the project. Lump sum contract requires a well defined scope of work that completely provides project performance requirements. Due to the complete project definition, the execution phase of the project is usually more efficient and shorter in lump sum framework.
- **Unit Price:** In the unit price arrangement, the contractor performs each unit of work on a fixed rate. The unit may be the volume of excavation or the length of piping in construction phase of the project.

3.2. Cost Reimbursable Contracts

Under a cost-reimbursable form of contract, the owner agrees to reimburse the contractor all of its costs plus an agreed upon fee and often, all of the contractor's main office costs, costs of financing, etc., are included in the fee (Carty, 1995). Cost reimbursable contracts are more flexible to changes and unpredictable situations. However, in this contractual framework the owner does not have a clear vision of its financial commitment and the contractor is not motivated to minimize the project costs (Nkuah, 2006). Under this contracting strategy, project risks are mostly transferred to the owner. Selecting contractor in a cost reimbursable contract is usually a subjective, easy, and fast process, while it is formal, difficult, and slow in lump sum contracts. Several variations are commonly used in the cost-reimbursable contracts including cost plus percentage of cost, cost plus fixed fee, and cost plus incentive fee.

- **Cost Plus Percentage of Cost** or **Time and Materials Contract:** This contract type guarantees payment to the contractor of its actual costs plus a specified percentage of costs that covers contractor’s overhead and profit (MacEving, 2001).
- **Cost Plus Fixed Fee:** In this contract type, the contractor is reimbursed its actual costs plus a pre-agreed fixed fee.
- **Cost Plus Incentive Fee:** In this contract type, time and quality criteria are specified in the contract. If the contractor meets the specified criteria, it is paid its actual costs plus a set fee. If the contractor exceeds those criteria, is paid an additional fee and if the

contractor does not meet the criteria, the fee is less (Fisk and Reynolds, 2006).

3.3. Guaranteed Maximum Price (GMP) Contracts

In this contract type, the contractor is paid his actual cost in addition to an agreed upon fee while he guarantees that the total cost to the owner will not exceed a stipulated maximum amount (Boukendour, 2001).

4. Convertible Contracts

The convertible contract starts under a cost reimbursable scheme when the scope of work is incomplete and once the project is well defined, converts to a fixed lump sum price. This contractual framework brings several benefits to the project. Starting the project under a cost reimbursable contract reduces the risk premiums and contingency amounts due to the incomplete project definition and scope of work. Besides, converting the contract when the contractor has more accurate information to bid a realistic fixed price provides a clear vision of the project overall cost.

4.1. Bidding/Award Approaches

There are different bidding award approaches to execute oil and gas projects based on the owner preference and the transition strategy from the FEED phase to the execution or EPC phase of the project. Figure 4 shows three different bidding/award approaches mostly used to apply convertible contracts in EPC oil and gas projects.

Approach 1: One approach is to engage the contractor at the pre-execution phase of the project to be involved in the planning and design development process. The contractor proposes its unit rates as well as the conversion factors and the initial contract will be signed based on the pre-agreed conversion methodology and conversion factors (Brkic & Romani, 2009). In this approach the EPC bidding/award process is omitted and the owner continues the execution of the project with the same contractor who performed the FEED. The contractor carries out the FEED and part of the detailed engineering under a cost reimbursable contract and once the scope of work is well defined and quantities are known, the contract will be converted to a firm price. Involvement of the contractor in the pre-execution phase provides early communication between the owner and the contractor to develop the design package that reflects the contractor's views regarding constructability, work sequencing, and selecting subcontractors (Lawrence, 2009). Also, there will be a significant timesaving in overall project duration by avoiding the long and difficult EPC tendering process. However, there might be some problems in this approach in relation to early involvement of the contractor. In this situation, and in the absence of a direct competition, the contractor has high level of power in negotiating the fixed price and delaying the conversion time (Lawrence, 2009).

Approach 2: In order to deal with the existing concerns in the first approach, some owners prefer to conduct a separate EPC bidding process that may or may not be awarded to the same contractor that has already performed the FEED phase of the project.

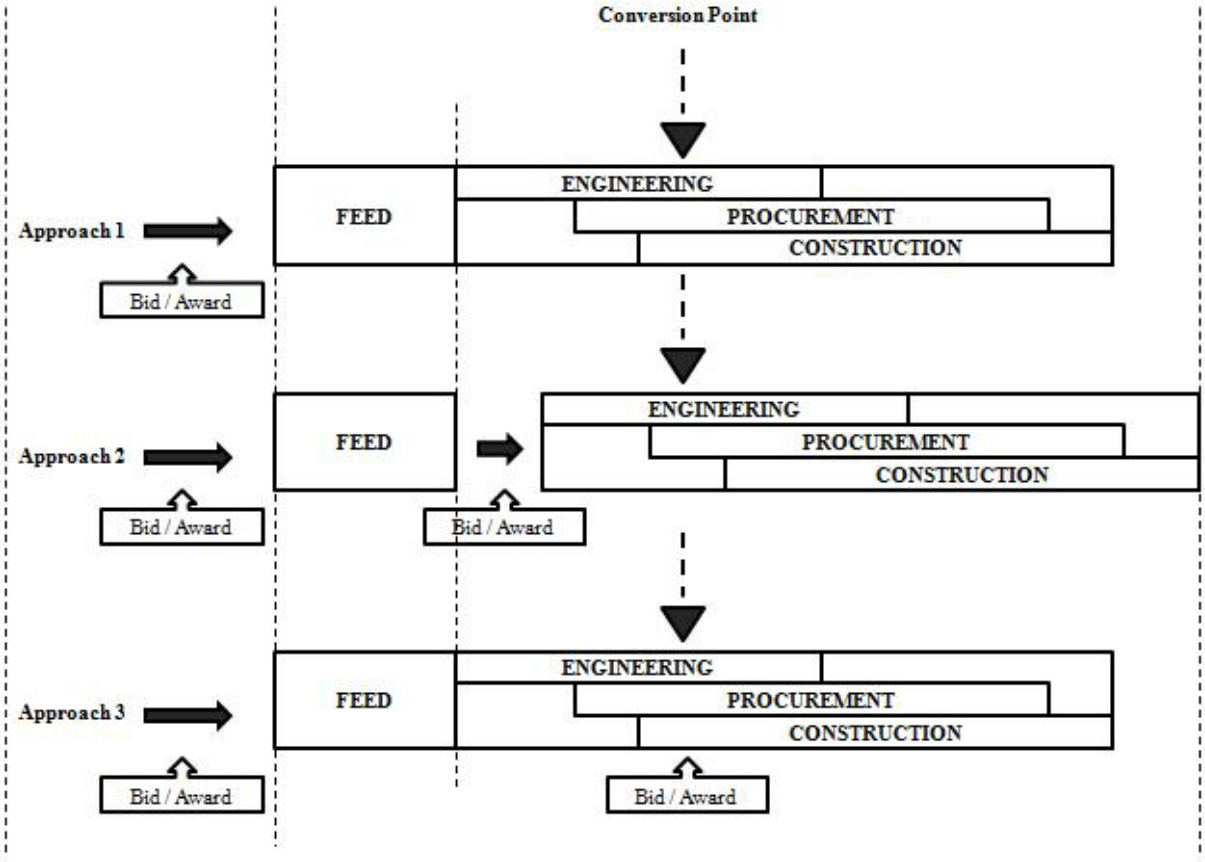

Figure 4: Different Bidding/Award approaches (Modified from Brkic & Romani, 2009)

Approach 3: Another approach to perform the projects under a convertible contractual framework is Two-Stage Tendering. In the first stage, a contractor is selected based on experience and skills rather than bidding price to perform services such as cooperating with the owner's engineering team to reach a final design, schedule and cost plan and tendering long lead items (Davis & Dornan, 2008). The owner and the contractor sign a separate pre-construction services agreement on a fixed fee or cost reimbursable basis. In the second stage, the owner and the contractor will try to agree and enter into a lump sum or guaranteed maximum price contract. The main advantage of this approach is that in case the contractor attempts to price stage two above its original guaranteed maximum price, the owner has an exit rout and is able to return to the market to tender for an alternative contractor (Davis & Dornan, 2008).

4.2. Conversion Time Framework

There is not an agreement on a certain time of conversion. Currently, project participants do not have an established framework and scientific approach to determine the time of conversion in a convertible lump sum contract and just rely on their experience which often results in different decisions. According to the literature survey and the contract documents review, the time of conversion is currently determined as below:

- **Based on the amount of detailed engineering that should be completed before conversion:** The accuracy of the project costs estimation to reach a reliable fixed price significantly depends of the amount of project scope and design completion. There are different opinions about the amount of engineering completion that enables the EPC contractor to bid an accurate and realistic fixed price. According to Brkic and Romani (2009), the best timing for "conversion" is after completing 50-60 percent of the detailed engineering.
- **Based on the amount of subcontract packages that should be subcontracted by the contractor before conversion:** This factor also has been used as a measure to figure out the time of conversion. Similarly, there is a range of answers for this term. Lawrence (2009) noted the conversion from a pre-construction agreement to a lump sum contract will typically occur when the contractor has successfully tendered 70-80 percent by value of the subcontract packages for the project.
- **The duration of pre-conversion period:** Avoiding delay in conversion time, some owners fix the duration of pre-conversion period. This strategy motivates the contractor to be more efficient in pre-conversion period.

Based on the acceptable cost risks and pre-conversion duration by decision makers in the project, the contract might be converted at different levels of project definition. In fact, the amount of detailed engineering or percentage of tendering subcontract packages, do not completely represent the level of project scope definition. There are other important factors like technical complexity, market condition, and execution approach (e.g. fast-tracking) that affect the project definition and deciding the time of conversion. The authors suggest using Project Definition Rating Index (PDRI) developed by Construction Industry Institute (CII) as a valid, reliable, and established instrument which accurately measures the project definition level. Therefore, the probability of achieving acceptable cost risks and pre-conversion period should be measured at particular levels of project definition (PDRI scores).

4.3. Conversion Process

According to a review of some contract documents, the conversion process in convertible lump sum contracts usually consists of three following steps.

Step1: Identifying Cost Items: Project cost items should be identified based on the project Work Breakdown Structure (WBS). Depending on the scope of work and scope of services in the contract, the project work might be broken down into the below main cost categories:

- Management Services
- Engineering and Procurement Services
- Material and Equipment Supply
- Construction, Installation, and Pre-Commissioning

For instance, supply of equipment might be divided into following subcategories and cost items:

Cost Category: Equipment

- Subcategory: Fixed Equipment
  - Cost item 1: Boilers and Heaters

- Cost item 2: Heat Exchangers, Air Coolers, and Condensers
- Cost item 3: Vessels and Reactors
- Cost Item 4: Tanks

- Subcategory: Rotary Equipment
  - Cost item 1: Pumps
  - Cost item 2: Compressors
  - Cost item 3: Turbines
  - Cost item 4: Mixers, Agitators, and Ejectors

Step2: Base Costs Estimation: The cost of identified items will be determined based on Open Book Estimation (OBE) methodology.

Step3: Applying Conversion Factors:
Figure 5 presents a typical conversion process in convertible lump sum contracts.

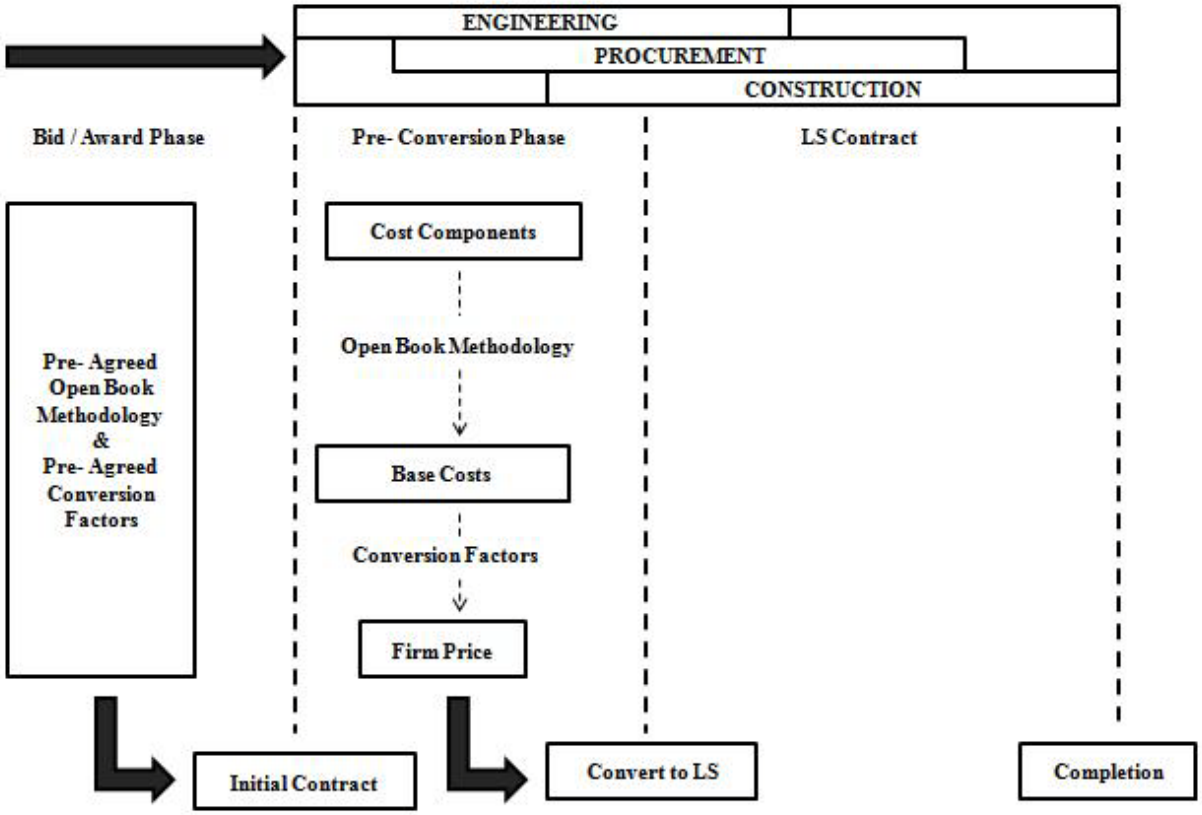

Figure 5: The typical conversion process in a convertible contract

By applying the pre-agreed conversion factors to estimated cost items, contracting parties will be able to reach a fixed fee and perform the rest of the project under a lump sum contract. The efficiency of the conversion process is highly affected by the quality of the engineering management, cost engineering, and construction management. Also, residual risks at the time of conversion and financial indicators are decisive elements to determine the conversion factors.

5. Conclusion

Commonly used conventional forms of contracts in oil and gas projects such as Cost Reimbursable and Fixed Price (Lump Sum) inequitably shift the project risks to the owner or the contractor. Inappropriate contractual frameworks result in more claims, disputes, and cost overruns in large and complex oil and gas projects. In recent years, the convertible lump sum contract has been used in some oil and gas projects to address the needs for fast-tracking and optimize the risk allocation between contracting parties. However, few studies have been done on the execution and conversion process of this new contracting strategy and project participants do not have a clear vision of the optimum time of conversion and the best methodology to reach the firm price in the contract.

There are various strategies to involve the Engineering, Procurement, and Construction (EPC) contractor in convertible contracts depending on the owner discretion and the transition strategy from the Front-End Engineering and Design (FEED) phase to the execution of the project. Some owners engage the contractor at the pre-execution phase of the project to be involved in the planning and design development process, while the others prefer to conduct a separate EPC bidding process that may or may not be awarded to the same contractor that has performed the FEED phase of the project.

Currently, the time of conversion is determined as below:

- Based on the amount of detailed engineering that should be completed before conversion
- Based on the amount of subcontract packages that should be tendered by the contractor before conversion
- A fixed pre-conversion period

However, conversion of the contract strongly depends on the level of scope definition, acceptable cost risks, and tolerable pre-conversion period in the project. Therefore, the authors suggest measuring the probability of achieving acceptable cost risks and pre-conversion period at particular levels of project definition. Project Definition Rating Index (PDRI) should be used as a valid instrument to measure the level of project definition.

The conversion process in convertible contracts usually consists of three following steps:
Step1: Identifying Cost Items
Step2: Open Book Estimation (OBE)
Step3: Applying Conversion Factors

The quality of the engineering management, cost engineering, and construction management significantly affects the effectiveness of the conversion process. Besides, economic conditions and financial indicators are important issues to determine the conversion factors. Regardless of the technical aspects, trust and collaborative relationships between the owner and the contractor is a major requirement for a successful convertible contract in EPC oil and gas projects.

6. Acknowledgement

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