

Risk-sharing Strategies on EPC Contracts: Lessons-learned from Sabine Pass Liquefaction Project

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Abstract: ‘Sabine Pass Liquefaction Project (SPL Project)’, a case study in this report, is the first construction project of a U.S. liquefaction facility for shale gas export overseas. This study analyzes the SPL Project to give understanding and a guideline to Korean EPC companies by benchmarking about effective risk-sharing strategies on EPC contracts. This study consists of three parts. The first summarizes the liquefaction process adopted on the SPL Project, named the ‘ConocoPhillips Optimized Cascade Process’, and compares it with other competitive liquefaction processes. The second introduces the unique features of the SPL EPC contract by comparing it with two other EPC forms of contracts: a FIDIC Silver Book for onshore plant projects and a contract of an offshore oil production (FPSO) project. The third focuses on the complexity of project financing (PF), especially lenders control and impact on the EPC contract such as covenant provisions to constrain variations and changes on the EPC Contract. From these conclusions, it is anticipated that this case study can provide a guideline for successful performance of Korean EPC contractors overseas.

Keywords: SPL project, Cascade process, EPC contract, Project financing and Risk-sharing strategy

I. INTRODUCTION

Global natural gas consumption is gradually growing, leading the global LNG (Liquefied Natural Gas) market to grow significantly over the last decade. In addition, the U.S. shale gas revolution in recent years has resulted in massive growth in U.S. natural gas production. Due to these circumstances, the U.S., which used to be one of the largest natural gas importers, has become a significant LNG exporter.

‘Sabine Pass Liquefaction Project (SPL Project)’, case study in this paper, is the first construction project of a U.S. liquefaction facility for overseas shale gas export overseas. This project has several unique features in their EPC contract in dealing with contractual risks in favor of the EPC contractor (Bechtel). This study analyzes the SPL Project to give understanding and a guideline to Korean EPC companies by benchmarking about effective risk-sharing strategies on EPC contracts.

II. LIQUEFACTION PROCESS

This study consists of three parts. The first summarizes the liquefaction process adopted on the SPL Project, named the ‘ConocoPhillips Optimized Cascade Process’, and compares it with other competitive liquefaction processes. The summarized description is listed in TABLE I.

SPL project are designed based on the ‘ConocoPhillips Optimized Cascade Process’. Since it requires relatively many equipment at each cycle, the initial investment cost and maintenance costs are high. However it is suitable to design large LNG train, because it requires relatively little power. [1] In addition, this process has many positive characteristics, such as production flexibility, nitrogen removal, vapor recovery, rate flexibility, minimal space requirements and ease of operation, compared with other competitive liquefaction processes. This advantage of the ‘ConocoPhillips Optimized Cascade Process’ explains why owner selected the cascade process at SPL Project.

TABLE I Feature Comparison of liquefaction process

	Cascade	N ₂ Expander	SMR	C3MR
Thermal Efficiency	Medium	Low	Medium	High
Specific Power (kW·day/ton)	14.1	16.5	14.5	12.2
Equipment Count	High	Medium	Low	Medium
Refrigerant Storage	Large	None	Medium	Large
Reliability	High	High	High	High
Specific Capital Investment	Medium	High	Low	Medium
Availability	High	Medium	High	High

III. EPC CONTRACT

The second introduces the unique features of the SPL EPC contract by comparing it with two other EPC forms of contracts: a FIDIC Silver Book for onshore plant projects and a contract of an offshore oil production (FPSO) project.

TABLE2 shows that like other contract, SPL EPC contract also has owner’s review period. In SPL Project, however, contractor can have the right to disapproval or CO(Change Order) if Owner unreasonably disapproves Drawings and Specifications. Due to the fact that this condition minimize the risks of EPC contractor thus it is beneficial for EPC contractor.

TABLE2 Comparison of Condition ‘Owner’s review period’ [2], [3]

SPL Project Contract	3.3.C Review Process. Owner shall have up to ten (10) Business Days from its receipt of Drawings and Specifications. If Owner does not issue any comments, Contractor may proceed with the development of such Drawings and Specifications. If Owner unreasonably disapproves such Drawings and Specifications and such unreasonable disapproval adversely impacts Contractor’s cost, Contractor shall be entitled to a Change Order
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FIDIC Silver Book	5.2. Contractor's Documents. Each review period shall not exceed 21 days, calculated from the date on which the Employer receives a Contractor's Document and the Contractor's notice.
FPSO Project	**4.2 Approval of Contractor Documents. Company shall approve documents within fifteen (15) days of receipt of such items. If Company does not provide its approval or comments within the hereabove mentioned period, the related contractor document shall be deemed to have been approved

TABLE3, Only SPL project includes condition related to Termination from NTP. It means that EPC contractor of SPL Project has the right to termination from Owner's default. As a result, EPC contractor can prevent construction delay caused by Owner's default and obtain a compensation for it

TABLE3 Comparison of Condition 'Termination from NTP' [2], [3]

SPL Project Contract	16.7 Termination in the Event of Delayed Notice to Proceed. If Sabine Liquefaction fails to issue the notice to proceed by December 31, 2013, then either party may terminate the EPC Contract, and Bechtel will be paid costs reasonably incurred by Bechtel on account of such termination and a lump sum of \$5,000,000.
FIDIC Silver Book	N/A
FPSO Project	N/A

TABLE4 indicates all of contracts cover compensation related to Force Majeure, but the coverage are somewhat different according to the contracts. As FIDIC Silver Book, SPL EPC contract includes EOT(Extension of Time) and CO. FPSO project contract, in contrast, include only EOT.

TABLE4 Feature Comparison of Condition 'Force Majeure' [2], [3]

SPL Project Contract	6.8 Force Majeure. Completion of the Work is delayed by Force Majeure, Contractor shall be entitled to an extension to the Target Substantial Completion dates and adjustment to the Contract Price to the extent.
FIDIC Silver Book	19.4 Consequences of Force Majeure. If the Contractor is prevented from performing obligations under the Contract by Force Majeure and/or incurs Cost by reason of such Force Majeure, Contractor shall be entitled subject to (a) an extension of time for any such delay (b) payment of any such Cost
FPSO Project	**1 Suspension of Work for Force Majeure. Each Party shall bear separately all direct and indirect financial consequences of such Force Majeure situation and no extra payment shall be due to Contractor by Company. Time extensions for delays shall be determined in accordance with the applicable provisions

This comparison discusses the relationship among the EPC contracting parties for major contracting conditions as lessons-learned about risk-sharing strategies between the owner and the contractor on EPC contracts for Korean EPC contractors

IV. PROJECT FINANCING

The third focuses on the complexity of PF(Project Financing). This study was carried out by analysing Common Terms Agreement between the lenders and SPC(Special Purpose Company). Due to Bankability, lenders restrain SPC's right related to provisions of EPC

contract between the EPC contract and SPC. Also lenders obtain the right to control project directly or indirectly. Table5 shows Common Terms Agreement conditions.

TABLE 5 Feature Comparison of Condition 'Covenants' [4]

Affirmative Covenants	6.21 EPC Contract. ...after giving effect to such Change Orders, the Contract Price is not in excess of four billion twenty-four million Dollars (\$4,024,000,000) or, if the Contract Price exceeds such amount, the Borrower or any other Person on behalf of the Borrower shall, within thirty (30) days after the expiration of the Provisional Sums Fixing Period, have transferred to the Common Security Trustee for deposit into the Construction Account equity funds...
Negative Covenants	7.4 Performance Tests and Liquidated Damages. The Common Security Trustee, each Secured Debt Holder Group Representative and the Independent Engineer shall have the right to witness and verify each Performance Test. The Borrower shall not...
	7.13 EPC and Construction Contracts. The Borrower shall not except for Change Orders, initiate or consent to (without the consent of the Required Secured Parties in consultation with the Independent Engineer) any Change Order that increases the contract price of the EPC Contract as of the Closing Date

Since most of the projects which need PF are generally mega-project and they are characterized as non-recourse, lender require project to be higher bankability. Therefore lenders want to control and impact on the EPC contract such as covenant provisions to constrain variations and changes on the EPC Contract.

V. CONCLUSIONS

In brief, this SPL Project case study suggests some changes in Korean EPC contractor's approaches toward contractual risks by analyzing their strategies of risk-sharing more comprehensively in the project development stage (in bid stage). In addition, this study emphasizes the importance of determining the impact of project financing on EPC contractor's liability constraints from the lenders. From these conclusions, it is anticipated that this case study can provide a guideline for successful performance of Korean EPC contractors overseas.

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REFERENCES

- [1] Lim, W., K. Choi, and I. Moon, *Current status and perspectives of liquefied natural gas (LNG) plant design*. Industrial & Engineering Chemistry Research, 2013. 52(9): p. 3065-3088.
- [2] *Form 8-K, Exhibit 10.1 - Lump Sum Turnkey Agreement for the Engineering, Procurement and Construction of the Sabine Pass LNG Stage 2 Liquefaction Facility*, 2012, UNITED STATES SECURITIES AND EXCHANGE COMMISSION.
- [3] *Conditions of Contract for EPC/Turnkey Projects. 1999*: FEDERATION INTERNATIONALE DES INGENIEURS-CONS
- [4] *Form 8-K, Exhibit 10.5 - Common Terms Agreement, 2012*, UNITED STATES SECURITIES AND EXCHANGE COMMIS