Project Investment Analysis on New Oil and Gas Field Development (M-X) at Pt. PTM

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ABSTRACT

PT. PTM as one of major oil and gas company in Indonesia contributes highly to fulfilling oil and gas demand in Indonesia. However, with more than 40 years of operation, PT. PTM is currently at its declining phase. Aggressive development projects have been planned to sustain PT. PTM production. The latest development project is M-X new field developments.

This Final Project is intended to assess the M-X Project feasibility in terms of economic terms considering possible dynamic changes in several factors. The results of this final project will help PT. PTM management decide whether to invest in the development of the M-X field. Both Discounted and Non-Discounted Cash Flow (DCF and Non DCF) will be used in the M-X Project investment analysis. Revenue and cost breakdown will follow Production Sharing Contract (PSC) – Cost Recovery scheme as applied for PT. PTM. The Non-DCF analysis shows that 264.65 MMUSD net cash flow will be generated for the Government due to M-X development while PT. PTM will gain 49.97 MMUSD with payback period of 3 years after M-X production. DCF analysis result shows that Project Net Present Value (NPV) is 4.35 MMUSD with an IRR of 12%. Financial risk due to dynamic changes in oil and gas project is analyzed using Montecarlo simulation that resulted in 23.3% probability to have negative NPV with Mean NPV of 13.93 MMUSD. The analysis result from Non-DCF and DCF method shows positive result for PT. PTM management to proceed with investment planning for M-X field development.

Keywords: Discounted Cash Flow, Montecarlo Simulation, Non-Discounted Cash Flow, Project Investment Analysis.

I. INTRODUCTION

Oil and Gas is still the primary energy source in Indonesia. EIA (U.S. Energy Information Administration) publication on 2021 based on Indonesia's Ministry of Energy and Mineral Resources data shown that Petroleum and Natural gas utilization in Indonesia at 2020 reach 49% from total Indonesia energy consumption.

However, those resources are not renewable and based on SKK MIGAS Annual report of 2021, in Indonesia since early 2000 for oil and 2011 for gas, production has been declining.

New development projects to boost oil and gas production in the mature field is becoming more challenging especially when the oil and gas reserve become more marginal with high investment cost. Development projects in oil and gas fields also possess high risk due to its nature that have various uncertainty. However, it is essential as to main sustainability of Indonesian energy supply and the Oil and Gas Company existence. Hence, investment decisions in oil and gas business needs to be rigorously assess considered possible uncertainty factors.

PT. PTM is one of Indonesian Oil and Gas company that has experience for more than 40 years in Indonesian oil and gas industry. Gas production from PT. PTM is distributed to domestic industries in the surrounding area as well as exported to overseas LNG consumers. Oil and associated condensate are exported to consumers via Tanker as shown in Fig. 1.

PT. PTM currently has been considered as a mature field or in its declining phase. As one of Indonesian Oil and Gas company, PT. PTM has responsibility to support government in fulfilling the Indonesian energy demand. In the other hand, Government has launched commitment and target to achieve 1-million-barrel oil per day and 12 thousand MMScfd production to fulfill Indonesian energy demand by 2030.

M-X is a new field that will be developed in PT. PTM Operating area. M-X reserve contains both gas and oil hydrocarbon with estimated 43.7 MMBoE. Additional production from M-X field is expected to be 60 MMScfd of gas and 1,000-barrel oil per day. A new permanent conventional offshore platform is planned to be installed to accommodate M-X production, complete with the topside processing facilities (i.e collection manifold, instrumentation system, gas lift system, etc). The production will be routed to the nearest existing pipeline network and processing facilities.

Marginal resources with high investment cost due to offshore installation complexity, in addition to high
uncertainty in its business nature make M-X development a challenging project. The best scenario to develop and produce M-X field that give optimum economic benefit needs to be assessed.

II. LITERATURE REVIEW

Gitman et al. (2012) mention that capital budgeting is a process of evaluating and selecting long-term investments that are consistent with the firm’s goal of maximizing owner’s wealth. Several capital budgeting techniques that will be used in this research consist of payback period (PB), net present value (NPV), profitability index (PI), and internal rate of return (IRR). NPV is defined as follows.

\[
NPV = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} - CF_0
\]

\[
PI = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} \cdot \frac{1}{CF_0}
\]

where

- \(CF_t\) = Cash flow at period year \(t\);
- \(CF_0\) = Initial Cash flow;
- \(r\) = internal rate of return.

Internal Rate of Return (IRR) is defined as the discount rate that makes NPV equal to $0.

In addition to the Capital budgeting method, Production Sharing Contract (PSC) with Cost recovery Scheme as shown in Fig. 2 will be utilized in calculation of Company cash flow since PT. PTM and the Indonesia government has Production sharing contract (PSC) with cost recovery scheme agreement. In this type of contract, all expenses due to oil and gas exploration and development will be reimbursed by the government in exchange for splitting revenue from oil and gas sales.

III. METHODOLOGY

Investment decision in this study will be evaluated using capital budgeting analysis, with common Discounted Cash Flow (DCF) for NPV, IRR, and Profitability Index evaluation and non-discounted cash flow for Payback period analysis. This approach is selected with consideration of shorter planning of platform life compared to common offshore oil and gas platform design life, as well to reduce the complexity in performing the financial analysis in the selection phase.

However, to accommodate potential uncertainty in projected cash flow of oil and gas industry, scenario analysis and Montecarlo simulation will be performed to give broad view of potential financial risk during project implementation. Parameter changes in scenario-based analysis and Montecarlo simulation refer to main factors that will affect the oil and gas business. Those main factors result from external and internal business environment analysis. Investment analysis for M-X new development will consider Production Sharing Contract with cost recovery scheme.

Summary of Conceptual framework is shown in Fig. 3. The main highlight of the following Conceptual framework is extracted from Capital Budgeting Techniques refer to Gitman (2012).

IV. RESULT AND DISCUSSION

A. Business Environment Analysis: External

PESTEL analysis framework is used to identify external factors in Political, Economic, Social, Technology, Environment and Legal that highly influence Oil and Gas industry.

1) Political factors

Political instability will shape the global oil and gas demand, that will further be impacting the commodities supply. Another important factor is government regulation that has power to put pressure on Oil and Gas company to be aligned with government objective (achieve 1-million-barrel oil and 12 thousand MMscdf gas by 2030). This objective provides challenge to fulfill the government target as well as opportunity in development of oil and gas project as government will support the goal of the project.
2) Economic factors
Economic growth will drive higher oil and gas demand as main energy sources. In contrary, economic slowdown might drive lower demand. The movement in supply and demand will affect the oil and gas prices and further impact the oil and gas economy.

3) Social factors
Social factors refer to shifts in trending of how society behaves or approaches its life. Nowadays, society has increased awareness of clean energy. It creates a challenge in the oil and gas industry to change its business model to include the ESG consideration in its design and operation. Specifically, In Indonesia, domestic industry driven by government regulation has more awareness for global competitiveness to provide high quality product than can be used and expected to be supported by domestic oil and gas industry.

4) Technology factors
The oil and gas industry has slow response toward new technology since it requires rigorous assessment from study to field trial for ensuring the safety of its operation. However, following current trend of digitalization and Internet of Thing (IOT) era, oil and gas industry can speed up its adaptation for new technology to be more efficient in operation and increase its profitability.

5) Environment factors
Oil and gas as energy sources are also affected by environmental conditions, especially in seasonal countries. Cold weather becomes one driver for more oil and gas demand, in contrary for hot weather. Another factor in environmental aspect is similar with social factor in term of clean energy awareness that affect oil and gas industries business model, shifting to clean energy.

6) Legal factors
The awareness of clean energy is manifested in the Paris Net Zero Carbon Emission commitment, in which several countries have declared their commitment and launched regulations to support the new zero carbon emission objective in the targeted year. Particularly in Indonesia, new oil and gas project is required to calculate the carbon emission generation and carbon tax will be implemented. Another challenge in Indonesia is government regulation to use 100% domestic material.

B. Business Environment Analysis: Internal
Value chain analysis will be used in this review to better understand the economic value creation in oil and gas project development in each breakdown set of activities.

New field development at PT. PTM consists of several development phases starting from concept development study (initiation study and selection study) which has nature of low subsurface maturity level, to engineering studies (FEED or detail engineering study) which detailed the selected development concept and has mature subsurface basis, until execution phase which involve in material procurement, fabrication, and installation, and finally production phase.

As described in Fig. 4, each development phase has its own main challenges with involvement of several different parties.

Fig. 4. Steps of New Field Development at PT. PTM.
On the other hand, this phasing provides an advantage for the company to ensure that project development is assessed rigorously and has enough maturity to be executed with involvement of various subject matter experts in each step. This study is performed to assess whether new oil and gas field M-X is economically feasible to be developed until production phase.

C. Financial Analysis

1) Non-Discounted Cash Flow (Non-DCF)

Net cash flow calculation for both Government and Contractor is presented in Fig. 5. The total cumulative non discounted cash flow for Government due to M-X development is 264.65 MMUSD, while contractor will get total net non-discounted cash flow of 49.97 MMUSD. Refer to cash flow illustration, contractor cash flow starts positive after 2028 or 3 years after M-X production is put on production.

Fig. 5. Non-DCF after M-X Development.

2) Non-Discounted Cash Flow (Non-DCF)

A summary of discounted cash flow analysis is presented in Table I. NPV resulted is still positive with total NPV of 4.35 MMUSD, PI more than 1 and IRR of 12% (higher than company hurdle rate).

TABLE I: SUMMARY OF DISCOUNTED CASH FLOW

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Worst Case</th>
<th>Base Case</th>
<th>Best Case</th>
<th>STD. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPV (in MMUSD)</td>
<td>4.35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PI</td>
<td>1.06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IRR</td>
<td>12%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3) Sensitivity Analysis

Prior to Montecarlo simulation, sensitivity analysis is performed to determine the main parameter that has major impact toward Project economic. In sensitivity analysis, several main parameters are adjusted and the impact toward project NPV is calculated.

Based on the tornado chart, the main factors to be monitored during the project evaluation are Gas and Condensate Production, as well Gas price. 20% changes in those parameters resulted on major project NPV changes.

4) Montecarlo Simulation

In Montecarlo simulation, two main parameters above will be analyzed to give a better risk view for management in case of dynamic changes from both parameters. Worst- and best-case ranges are selected based on company historical similar projects record. 1000 simulation has been performed using combination of random number from those parameters.

Montecarlo simulation result showed that average NPV that most probably occurred is at 13.93 MMUSD. However, there is a 23% probability that the Project might have negative NPV. The simulation results are presented in Table II, Table III, and Fig. 7.

TABLE II: SENSITIVITY PARAMETER FOR MONTECARLO SIMULATION

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Worst Case</th>
<th>Base Case</th>
<th>Best Case</th>
<th>STD. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas and Condensate Production</td>
<td>80%</td>
<td>100%</td>
<td>110%</td>
<td>12%</td>
</tr>
<tr>
<td>Gas price</td>
<td>80%</td>
<td>100%</td>
<td>110%</td>
<td>12%</td>
</tr>
</tbody>
</table>

Fig. 7. NPV Distribution from Montecarlo Simulation.

TABLE III: MONTECARLO SIMULATION RESULT

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum NPV</td>
<td>(38.81) MMUSD</td>
</tr>
<tr>
<td>Maximum NPV</td>
<td>88.71 MMUSD</td>
</tr>
<tr>
<td>Mean NPV</td>
<td>13.93 MMUSD</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>19.01 MMUSD</td>
</tr>
<tr>
<td>Probability NPV&lt;0</td>
<td>23.29%</td>
</tr>
</tbody>
</table>

V. CONCLUSION AND RECOMMENDATION

A. Conclusion

M-X development project is important as to maintain production as well business sustainability of PT. PTM. In addition, this project also contributes to fulfillment of Indonesian government target to achieve 12 thousand MMsCfd gas and 1 billion bold as Indonesia energy supply. However, following its marginal resources and high-risk business environment of Oil and Gas project, M-X development feasibility in term of economic shall be assessed prior final investment decision is made by PT. PTM management and government of Indonesia as contract partner.
Based on the project investment analysis result, M-X development shows positive economic added value for the company, i.e., project payback period will be achieved in 3 years after M-X production is in place, positive NPV with value of 4.35 MUSD will be generated for 7 years of production lifetime, IRR is 12% (higher than company hurdle rate at 10.46%).

In terms of risk evaluation, based on sensitivity analysis/Tornado chart analysis, there are two factors that highly influence the Project economic which are Gas and Condensate production and Gas Price. Both factors become important factors to be monitored and considered in this Project. From the Probabilistic approach using MonteCarlo simulation, the probability for M-X development project achieve positive NPV is ~ 77% with the average NPV is 13.93 MUSD.

Based on the above result, it can be concluded that M-X development project is economically feasible to be developed further since it gives positive economic added value to Company and government.

B. Recommendation

Several possible improvements that can be further assessed in the next research or study are as follows.

1) New Production scenario

Option 1: Gas and oil simultaneous production with unlocking more oil production. Option 2: Gas mode production on the 1st stage, Oil mode production on the 2nd stage.

In the current M-X production scenario assessed in this study, oil is only being produced for 5 months and contributes to negative NPV to the project, even though the final NPV for total production is positive. Author suggests subsurface team to conduct more robust assessment on the potential of oil production, including possibility to use oil revival technology (i.e., gas lift system, enhanced oil recovery, etc.) to unlock more oil production hence able to provide more economical benefit to the overall project. Another option is not to produce oil in the early stage of the M-X development until a more mature oil development concept is defined.

2) Company capital cost

The financial analysis in this review is performed using current data with Parent Company’s capital structure of 38% debt and 62% equity composition. There is a possibility that with higher investment planning in the future, the composition of debt might be higher than the current proportion. In will impact the Weighted Average Cost of Capital, hence also impacted M-X project economic calculation. Review of the company financial capital structure strategy is to be performed prior performing this sensitivity analysis.

3) Develop Project Risk Register for M-X Development

In the risk register, all potential risks including low gas production and low gas price are identified and measured. The mitigation action plan, entity in charge, timeline and the monitoring method are identified and agreed.

4) Ensure Gas and Oil Commercialization Plan has been well developed

Different gas consumers contribute to different Gas market price, as well as oil. Priors execute the M-X field production, regular coordination to be performed with Commercial team, to ensure mature commercialization plan, including the alternative scenarios has been developed to have proper financial data during assessment of project economic.

5) Develop strategy for production scenario and Re-baseline of subsurface model based on actual production

Oil and gas reserve in new field is based on several assumptions and typicality with adjacent field. Hence, production strategy is important. Subsurface and development team shall define whether well will be drilled and Put on Production one by one or simultaneously for several wells with considering drilling rig cost and potential of less production as estimated. After one or several wells production, sub surface team need to reassess their subsurface model with the actual condition which can give updated production forecast. The updated production forecast will be used to update the project economic calculation as management decision to continue drilling remaining wells or stop/hold the campaign to further reduce project expenses.

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