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INVESTMENT ANALYSIS FOR LARGEST HEAVY OIL FIELD IN INDONESIA UNDER INDONESIA'S GROSS SPLIT PRODUCTION SHARING CONTRACT

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Abstract. *As largest heavy oil field in Indonesia, XYZ field is important portfolio to National Oil Company (NOC) as they will operate the field (as part of ABC Block) starting August 202. NOC will manage ABC Block under new form of PSC, the Gross-Split PSC that just established in 2017, changing from current model of Cost Recovery PSC that has been implemented in ABC Block for more than 20 years. This research aims to assess the investment analysis of XYZ field. Result from strategic approach show that ABC Block, especially XYZ field has a competitive advantage therefore NOC should maximize its investment in ABC Block. For investment evaluation, there are three alternatives of investment that author proposed in this research: (1) Current Area Development Program, (2) New Area Development Program, and (3) Combination. The results of economic evaluation are; Alternative-1: NPV USD 504.7MM and IRR 10.4%, Alternative-2: NPV USD 795.8MM and IRR 15.0%, and Altenative-3: NPV USD 1,386.0MM and IRR 31.0%. The risk analysis using Coefficient of Variance (CV) show CV values of 0.91, 0.62, and 0.43 for Alternative-1 to Alternative-3 respectively. Thus, it can be concluded that Alternative-3 is best alternative due to highest NPV value and lowest CV value.*

Keywords: *Investment; Heavy Oil; Gross Split; Production Sharing Contract*

INTRODUCTION

XYZ Oil Field (XYZ field) is the largest heavy oil producing field in Indonesia, approximately 18km long and 18km wide. It is located in ABC Block Production Sharing Contract (ABC Block PSC) in Bengkalis Regency, at Riau Province, in the South Sumatra Basin on the eastern coast of Sumatera, Indonesia. ABC Block, once known as the biggest crude producing block in Indonesia– as its position has overtaken by Cepu Oil block in early 2019, produces around 208,000 bopd last year, or about 25% of Indonesia's total oil output. It has been operated by International Oil Company (IOC) or related name for more than 90 years. The area is around 6,264 km2, located in Riau province with 5 regencies: Siak, Bengkalis, Kampar, Rokan Hulu and Rokan Hilir.

Based on recent announcement from Government of Indonesia (GOI) in July 2018, this block will be handed over to National Oil Company (NOC) in August 2021 from International Oil Company (IOC). The investment analysis in XYZ field become important since NOC will operated the field (and the block) under new regime of PSC of Gross Split PSC.

LITERATURE REVIEW

METHODOLOGY

The business issue is to find the optimum investment strategy of largest heavy oil field in Indonesia under Indonesia's Gross Split PSC. In order to have optimum investment strategy it will need to analyze the external environment and internal environment. From internal and external analysis, business strategy can be developed and by performing investment analysis thru economic feasibility, we can arrive to the conclusion and recommendation.

The external environment will be evaluated based on data from general environment and industry environment. The general environment will analyze various aspect such as: demographic of Indonesia, economic contribution, political/legal to oil and gas industry, sociocultural, technological, global environment, as well as physical environment. While industry environment analysis will use Porter's Five Force concept. The internal environment will be evaluated using SWOT & TOWS of ABC Block PSC. By having qualitative analysis from internal and external environment, it is expected that we will have right business strategy analysis for next operator to operate in the heavy oil field under ABC Block PSC.

After having the business strategy, the other aspect that author will analyze is the quantitative assessment of economic feasibility of the investment. The economic feasibility will use capital budget analysis and sensitivity analysis. With various scenarios applied, it is expected that we will have optimum investment scenario based on quantitative analysis. After completing the quantitative and qualitative analysis, we combine the result and having a conclusion and recommendation to the investment of heavy oil field under gross split PSC.

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FINDINGS AND ARGUMENT

From the external environment analysis, some segment has positive impact to the industry, such as demographic segment, economic, technological, and global segments. The condition of Indonesia as 4th largest population in the world and the outlook of economic of Indonesia made Indonesia as an attractive place for investment. The political/legal segment has negative impact as a result of complex regulation. This condition made the industries looks unappealing. It is also major reason of declining oil production for last two decades. The sociocultural and physical environment segments has medium-positive impact, as it can be controlled based on the business activities, and can be implemented with good project planning.

Analysis of the five forces allow the firm to determine the industry's attractiveness in terms of the potential to earn average or above average returns. In general, the stronger the competitive forces, the lower the potential for firms to generate profits by implementing their strategies. Based on five forces above, we can conclude that upstream oil and gas industry in Indonesia is an attractive industry that allow firm to earn average or even above-average returns by implementing its strategies.

Next important analysis to understand the business issue is internal analysis of ABC Block. The internal analysis will use SWOT analysis as it is a powerful tools to identify and analyze internal strength and weakness and external opportunities and threat. Summary of SWOT analysis can be seen in Table 1.

Table 1. Summary of SWOT Analysis

Strengths (+)	Weaknesses (-)
• High reserves • Low lifting cost • Established infrastructures • High skill and talented resources or employee	• Mature Field • Decline in production • Aging facilities
Opportunities (+)	Threats (-)
• Area for new POD • High demand for oil • New advance technology for tertiary recovery	• Oil price fluctuation • Unexpected regulation from government

In order to evaluate investment analysis in ABC Block, it is needed to develop alternatives to be assess. As common practices in the industry, the investment will involving new drilling programs, either to maintain production level or even to boost the production. Specific to XYZ field, the drilling programs can be executed in current developed area and in new area. Based on that condition, there are three alternatives to be assess.

First alternative (Alternative-1) is only executing new drilling program in existing area of XYZ field. This program typically called as a Horizontal Well (HW) program due to the drilling direction will be in horizontal direction instead of vertical direction. Alternative-1 will generate low additional production into Baseline with low investment cost. Second alternative (Alternative-2) is by developing new area in XYZ field. As informed earlier that there is opportunity to develop new area within XYZ field. Alternative-2 is expected to add production to estimate 45 MBOPD at its peak production as can be seen in production profile chart later. Last alternative (Alternative-3) is to combine both previous alternatives. Last alternative will have maximum additional production as well as maximum investment cost.

There are model assumption used in this research:

- Split Calculation is calculated based on condition of XYZ Field. In summary, total contractor split for XYZ field is 70%.
- Oil price will be based on approach of USD 65 per barrel, flat along the 20 years PSC contract life. This is based on judgment that historically that oil price is flat.
- Effective tax rate for corporate is 44% from internal sources.
- Investment analysis is calculated during PSC life for 20 years.
- Weighted Average Cost of Capital will be 10% as a hurdle rate
- Depreciation method for tangible well is 5-years with 25% per year depreciation while for other asset will be 7-years.

Alternative-1: Current Area Development Program

Production Profile Alt-1

Alternative-1 assumed that there is no development on new area of XYZ field, hence additional production will be based on HW drilling program on current area. The program will start immediately in Q3-2021 and ended in 2036 due to minimizing undepreciated cost from the program and will drill 3 new wells each month. The oil production is start with 62 thousand BOPD in

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2021 and followed by an exponential depletion rate of 15% over the lifetime of the PSC until it reaches 22 thousand BOPD in 2041.

Capital Expenditure Alt-1
Total Capital Expenditure for Alternative-1 is USD 1,268.9 million comprise of tangible drilling well of USD 232.9 million and USD 663.2 million of intangible wells. This number is representing 552 new drilling wells. There is also CAPEX about USD 372.8 million to construct pipeline from wellhead to nearest production line and other production facilities that will support the program.

Operating Expenditure Alt-1
The profile of variable cost is aligned with profile of oil lifting. In 2021, it is only 4-month operation hence total lifting is about 9.1-million-barrel oil with USD 114 million variable cost. The variable cost in 2022 is about USD 295 million to handle 23.2-million-barrel oil. Then variable cost is decline as production decline until it reaches USD 89.2 million to process 4.8-million-barrel oil in 2041.

Contractor's Cash Flow and NPV Alt-1
Based on Gross Split PSC Mechanism, the alternative-1 will generate total production of 339.35-million-barrel oil equivalent. In 2021, due to NOC is starting operation in end of August, it only receives 1/3 of yearly production. Gross Revenue in 2021 is USD594 million with contractor's share USD 415.84 million or 70% as split calculation. This share then deducted by OPEX, depreciation, ASR funding and tax to become contractor's take of USD 83.14 million. The cash flow schedule resulting contractor's NPV of USD 504.7 million. Based on capital budgeting calculation, the IRR of Alternative-1 is equal with 10.4%.

Alternative-2: New Area Development Program:
Production Profile Alt-2
Alternative-2 assumed that NOC will develop new area in XYZ Field. The development in new area hence give NOC more additional barrel to be lifting from reservoir. Due to the project is more complicated than HW Project in Alternative-1, The New Area development program will start in 2022 for about 8 years. The program will drill 5 new wells each month. The oil production is start with baseline number of 60 thousand BOPD in 2021 and planned to increase each year until it reaches its peak production of 71 thousand BOPD in 2029 and forecasted to decline until 27 thousand BOPD in 2041.

Capital Expenditure Alt-2
Total Capital Expenditure for Alternative-2 is USD 1,533.7 million comprise of tangible drilling well of USD 189.1 million and USD 538.4 million of intangible wells. This number is lower than total drilling cost in Alternative-1 due to it representing lower drilling wells of 480. Despite that, Alternative-2 has a higher Capital Expenditure to construct production facilities. Due to the program is to open new area, it is expected that NOC will construct production facilities such as Gathering Station, Test Station and other facilities to support the program. Total CAPEX for production facilities is USD 806.2 million.

Operating Expenditure Alt-2
The profile of variable cost is aligned with profile of oil lifting. In 2021, it is only 4-month operation hence total lifting is about 8.8-million-barrel oil with USD 110 million variable cost. The variable cost in 2022 is about USD 306 million to handle 23.9-million-barrel oil. Then variable cost is decline as production decline until it reaches USD 88.1 million to process 4.7-million-barrel oil in 2041.

Contractor's Cash Flow and NPV Alt-2
Based on Gross Split PSC Mechanism, the alternative-2 will generate total production of 391.39-million-barrel oil equivalent. In 2021, due to NOC is starting operation in end of August, it only receives 1/3 of yearly production. Gross Revenue in 2021 is USD572 million (lower than Alternative-1 due to no drilling program) with contractor's share USD 400.69 million or 70% as split calculation. This share then deducted by OPEX, depreciation, ASR funding and tax to become contractor's take of USD 81.07 million. The cash flow schedule resulting contractor's NPV of USD 795.8 million. Based on capital budgeting calculation, the IRR of Alternative-2 is equal with 15.0%.

Alternative-3: Combination Development Program:
Production Profile Alt-3
Alternative-3 as a combination between Alternative-1 and Alternative-2 has the highest production profile among the alternatives. The oil production is start with 62 thousand BOPD in 2021, increase each year as the new area development progressing until 2029 and then forecasted to decline until it reaches 35 thousand BOPD in 2041.

Capital Expenditure Alt-3
Total Capital Expenditure for Alternative-3 is USD 2,429.9 million comprise of tangible drilling well of USD 422.0 million and USD 1,201.6 million of intangible wells. This number is representing 1,002 new drilling wells. Since this Alternative is adopt Alternative-2, hence the CAPEX for production facilities is similar with Alternative-2 of USD 806.2 million to construct pipeline from wellhead to nearest production line and other production facilities that will support both programs.

Operating Expenditure Alt-3
The profile of variable cost is aligned with profile of oil lifting. In 2021, it is only 4-month operation hence total lifting is about 9.1-million-barrel oil with USD 114 million variable cost. The variable cost in 2022 is about USD 346.9 million to handle 27.2-million-barrel oil. Then variable cost is decline as production decline until it reaches USD 144.1 million to process 7.8-million-barrel oil in 2041.

Contractor's Cash Flow and NPV Alt-3
Based on Gross Split PSC Mechanism, the alternative-3 will generate total production of 542.01-million-barrel oil equivalent. In 2021, due to NOC is starting operation in end of August, it only receives 1/3 of yearly production. Gross Revenue in 2021 is USD 594 million (similar with Alternative-1) with contractor's share USD 416 million or 70% as split calculation. This share then deducted by OPEX, depreciation, ASR funding and tax to become contractor's take of USD 81.56 million. The cash flow schedule resulting contractor's NPV of USD 1,386.0 million. Based on capital budgeting calculation, the IRR of Alternative-2 is equal with 31.0%.

Sensitivity analysis is conducted to know how much the parameter of investment result will change due to changes on some aspect of the data. The parameter that will be analyze in sensitivity analysis are Oil Production, Oil Price, Oil Depletion Rate, and WACC Hurdle rate. The range of sensitivity are from -20% to +20% with an increase of every 10%.

Overall summaries of the sensitivity analysis are:

- For Alternative-1, NPV become negative when oil production or oil price is decrease more than 10% from baseline while increase in oil depletion rate up to 20% still giving positive NPV.
- For alternative 2, oil price is more sensitive than oil production and it is giving negative NPV when oil price decreases more than 17%. Increase in depletion rate up to 20% still giving positive NPV.
- For alternative 3, event ought oil price or production decrease to 20% from baseline, it still gives positive NPV.

From various number of result of NPV for alternative-1 to Alternative-3, we can calculate Coefficient of Variance that represent the risk of each alternative. From Table 2 below, Alternative-3 is having smallest Coefficient of Variant (CV) value, those it can be concluded that Alternative-3 is the best alternative to be selected.

Table 2. Summary Economic Result

	E(r)	STDEV	CV
Alternative-1	504.7	457.9	0.91
Alternative-2	795.8	489.7	0.62
Alternative-3	1,386.0	592.6	0.43

CONCLUSIONS

From external and internal analysis of ABC Block and XYZ Field using SWOT and TOWS analysis, there are five strategies that can be implemented: (1) Long-term investment planning; (2) Facilities Rationalization Program; (3) close coordination with stakeholders; (4) improve production level; and (5) maintain baseline production.

From those strategies, then it can be concluded that investment strategies that should be executed in XYZ field cannot be in short-term or medium term. The investment option must consider the production of XYZ field.

The results of economic analysis are as follow:

1. Those three alternatives are giving positive NPV and IRR that higher than hurdle rate which Alternative-1 has NPV of 504.7 million dollar and 10.4% IRR, Alternative-2 has NPV of 795.8 million dollar and 15.0% IRR, and Alternative-3 has NPV pf 1,386.0 million dollar and 31.0% IRR.
2. Alternative-3 as a combination from Alternative-1 and Alternative-2 is having highest NPV and IRR values.
3. Oil price and oil production have positive correlation to NPV & IRR while oil depletion rate has negative correlation. For

alternative-3, minimum NPV is happen when oil price drops 20% from baseline (80% * $65/bbl = $52/bbl) to around $224.3MM with IRR of 10.8% (close to hurdle rate of 10%).

4. Hurdle rate is less sensitive in three alternatives. Decrease or increase in hurdle rate up to 20% did not give significant impact to the NPV or IRR.
5. Based on further analysis using Coefficient of Variant (CV) method, it is shown that Alternative-3 has lowest CV value that other alternatives. This result is consistent with previous finding that Alternative-3 is the best alternative among the others.

The following are author's recommendation in order to maintain or increase the economic feasibilities in XYZ block:

1. NOC need to execute Alternative-3 as it has highest feasibility among 3 alternatives.
2. Development of new area in XYZ field require huge amount of capital. Despite hurdle rate has less impact to profitability of the field, it is important for NOC to find the capital, either in form of equity or in debt.
3. XYZ is a mature field that might be impact to higher depletion rate than it is predicted. In order to balance the depletion rate or decrease in production, NOC need to maintain it's operating expenditure.

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