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Investment Analysis For Monetization Of Marginal Oil Reserves: An Alpha Field Joint Operation Case Study

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ABSTRACT:
Challenges and opportunities are faced in the development of marginal oil reserves that are often uneconomical to exploit conventionally. The main objective of this study was to determine whether the project is a viable investment based on the given assumptions, as well as whether the potential returns can justify the risks associated with marginal oil reserves. The research method involved the use of key financial metrics such as Net Present Value, Internal Rate of Return, and Payback Period, using a discount rate of 10%, which is standard in the oil and gas industry. The results show that the project has a positive NPV of USD 124,462.38, an IRR of 13.13%, and a PBP of 4 years and 5 months. These results indicate that the project is financially viable, with returns exceeding the capital cost of the project. Further sensitivity analysis identified that oil prices and production levels are the most critical factors affecting the financial outcome of the project. Compared to the WACC of 10.25%, the IRR of 13.13% indicates that the project exceeds the minimum required rate of return, thus justifying the investment. The implications of this study highlight the importance of proper operational management and market risk mitigation to maintain profitability.

Keywords: Joint Operation, Investment Analysis, NPV, IRR, WACC, Sensitivity Analysis, Oil and Gas

INTRODUCTION

PT Utama, a regionally owned enterprise, plays a pivotal role in Indonesia's upstream oil and gas sector, with strategic goals aligned to support the national target of achieving one million barrels per day by 2030. The ALPHA Field, characterized by its marginal reserves, represents both an opportunity and a challenge for PT Utama in contributing to this target. Marginal fields like ALPHA, with their limited but potentially profitable reserves, are often overlooked due to the complexities and risks involved in their development (Iheobi et al., 2020). However, with the right strategic approach, these fields can be transformed into viable sources of revenue and energy production (Adeogun et al., 2018).

Given the inherent risks and uncertainties associated with marginal oil fields, a thorough financial feasibility assessment is critical to ensure that any investment made is sound and aligned

with the company's broader strategic objectives. The ALPHA Field project is not just an isolated opportunity but a critical component of PT Utama's broader portfolio aimed at supporting Indonesia's energy independence and meeting ambitious national production goals.

Marginal oil fields are defined by their relatively low reserves and high production costs, which often make them less attractive compared to larger, more productive fields (Ayu, 2022). However, with advances in extraction technology and strategic operational management, these fields can be economically viable (Putra et al., 2015). The success of such projects depends heavily on accurate financial forecasting, effective cost management, and the ability to navigate market fluctuations, particularly in oil prices (Wisnuwardhani, 2017).

The ALPHA Field project is structured as a Joint Operation (JO) with PEP, leveraging the strengths of both companies to manage the risks and optimize the potential returns. This collaborative approach is designed to spread the operational and financial risks while maximizing the expertise and resources available to the project. By aligning the project with the national energy goals and leveraging the JO structure, PT Utama aims to not only achieve profitability but also contribute significantly to the region's energy security.

Problem Statement

Monetizing marginal oil reserves through a Joint Operation (JO) scheme presents unique challenges, particularly in terms of financial viability. The ALPHA Field project's success hinges on various factors, including oil price stability, production efficiency, and cost management. Given these uncertainties, the primary issue addressed in this study is whether the proposed JO scheme is financially viable under current market conditions and regulatory frameworks, using a 10% hurdle rate for discounting cash flows as regulated by PTK 037 Revision 3 (2021). This study aims to provide a comprehensive analysis that will guide PT Utama in making informed investment decisions, balancing the potential for high returns against the inherent risks.

The complexity of operating in marginal fields adds another layer of risk, requiring meticulous planning and execution. These fields often require more sophisticated technology and operational strategies to ensure that the extraction process is both efficient and cost-effective. Additionally, the fluctuating nature of oil prices adds an element of unpredictability that can significantly impact the project's profitability.

The decision to invest in the ALPHA Field is also influenced by broader market conditions and regulatory policies, which can either support or hinder the project's financial viability. As such, this study will explore these external factors in detail, assessing their potential impact on the project's success. The analysis will focus on the interplay between these external factors and the project's internal financial metrics to provide a holistic view of the project's feasibility.

Previous studies have explored the challenges of developing marginal oil fields, emphasizing the need for efficient cost management, technological advancements, and strategic partnerships to mitigate the high operational risks (Baker & Solak, 2014); (Nair, 2011). However, these studies have primarily focused on larger oil-producing nations, with limited research

addressing the unique regulatory and market conditions in Indonesia's upstream oil sector. Moreover, while several studies have evaluated the financial feasibility of Joint Operation (JO) schemes in the oil and gas industry, there is a notable gap in understanding how such schemes can be optimized for marginal fields under the current Indonesian regulatory framework.

This study aims to address the identified research gap by evaluating the financial viability of a Joint Operation (JO) scheme specifically designed for marginal oil reserves in Indonesia, using the ALPHA Field as a case study. By applying capital budgeting metrics such as Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PBP), the study provides actionable insights for PT Utama and other entities operating in similar contexts. Through this analysis, the research contributes to the broader discourse on oil and gas investment strategies for marginal fields, particularly in developing countries with unique regulatory and market conditions.

The objectives of this study are to: (1) analyze the financial viability of the ALPHA Field project using capital budgeting metrics such as NPV, IRR, and PBP, under a 10% hurdle rate; (2) compare the project's IRR with the Weighted Average Cost of Capital (WACC) of 10.25% to assess its financial feasibility; (3) identify key variables that significantly influence the project's feasibility, particularly through sensitivity analysis; and (4) provide strategic recommendations for PT Utama regarding the investment decision, based on the financial analysis results. These objectives are designed to ensure a comprehensive analysis aligned with PT Utama's strategic goals. By focusing on key financial metrics and sensitivity analysis, the study provides actionable insights that will help PT Utama make informed investment decisions.

The significance of this study lies in its potential impact on PT Utama's decision-making process for future investments in marginal oil fields. By focusing on the financial metrics and their sensitivity to various factors, the study offers valuable insights that can help mitigate risks and optimize returns. Additionally, this research contributes to the wider discussion on oil and gas investment strategies, particularly in the context of achieving Indonesia's national energy production goals. Marginal fields, while challenging, present significant opportunities for companies like PT Utama to expand their operational footprint and enhance national energy security. The insights gained from this study will not only inform current investment decisions but also provide a framework for evaluating similar opportunities in the future. Furthermore, this study contributes to the academic literature on marginal field development, offering a case study that highlights the practical application of financial analysis in the oil and gas industry..

RESEARCH METHODS

The financial viability of the ALPHA Field project is assessed using a capital budgeting approach, with NPV, IRR, and PBP as the primary metrics (Andriana & Anggono, 2023). The analysis follows a structured process, beginning with data collection from the open data room provided by the JO partner, followed by the application of financial models to forecast cash flows and calculate the key financial metrics. This structured approach ensures that the analysis is

comprehensive and aligned with industry standards, providing reliable and actionable insights for decision-makers.

The capital budgeting approach is chosen for its robustness and wide acceptance in the industry. It allows for a detailed evaluation of the project's financial metrics, offering a clear picture of the potential returns and risks associated with the investment. This methodology is particularly suited to the complex nature of oil and gas projects, where large upfront investments and long project timelines necessitate thorough financial analysis.

WACC Calculation

Although the project's capital budgeting analysis uses a 10% hurdle rate for discounting cash flows, the study calculates the WACC at 10.25% using industry-standard metrics such as the Debt to Equity Ratio (D/E ratio), unlevered beta, and risk-free rate. This WACC serves as a comparative benchmark to the IRR, where the project is deemed viable if the IRR exceeds the WACC, ensuring that the investment provides a return greater than the cost of capital.

The WACC calculation is a critical component of the financial analysis, as it reflects the blended cost of capital, taking into account both debt and equity financing. By comparing the IRR to the WACC, the study ensures that the project's returns are sufficient to cover the cost of financing, providing a more accurate assessment of its financial viability.

The WACC is calculated using the following formula (Gitman et al., 2015):

$$WACC = \left(\frac{E}{D+E} \times K_e\right) + \left(\frac{D}{D+E} \times K_d \times (1-T)\right)$$

Where:

E = Company's equity value
D = Company's debt value
Ke = Cost of equity
Kd = Cost of debt
T = Corporate tax rate

Table 1. WACC Calculation

WACC		
Tax	JO Contract	33,7%
Discount Rate (Direct)	Internal	10,00%
Unlevered Beta	Damodaran	0,79
Levered Beta	calculation	0,91
Risk Free Rate	PHEI	4,93%
Equity Risk Premium	Damodaran	7,38%
Debt Ratio	Damodaran	18,88%
Debt Equity Ratio	calculation	23,28%
Before Tax Cost of Debt	Internal	6,24%
WACC		**10,25%**

The WACC serves as a hurdle rate against which the IRR is compared. If the IRR exceeds the WACC, the project is considered to provide adequate returns relative to the cost of capital (Zhang, 2021).

Data Collection

Data for this study is sourced from the open data room provided by the JO partner, which includes essential production data, commercial data, and financial assumptions necessary for the analysis. This data serves as the foundation for the financial models and sensitivity analyses conducted in the study.

The data collection process is critical to ensuring the accuracy and reliability of the analysis. The data includes historical production figures, cost estimates, and market projections, all of which are essential for building accurate financial models. The use of data from the open data room ensures that the analysis is based on up-to-date and relevant information, providing a solid foundation for the financial projections.

Sensitivity Analysis

The sensitivity analysis examines how changes in key variables—oil prices, production rates, and capital expenditures—impact the project's NPV. This analysis is crucial for understanding the project's risk profile and identifying the variables that have the most significant influence on its financial outcomes.

Sensitivity analysis is a vital tool in the financial analysis of oil and gas projects, where market conditions and operational factors can vary significantly over time. By examining how changes in these variables affect the project's NPV, the study provides insights into the potential risks and helps identify the critical factors that need to be closely monitored and managed.

The sensitivity analysis is conducted by varying each key variable by a certain percentage above and below its base case value, while keeping all other variables constant. This approach allows for a detailed examination of how each variable affects the project's financial outcomes, providing valuable insights into the project's risk profile.

RESULTS AND DISCUSSION

Financial Data Assumption

The financial analysis of the ALPHA Field project is based on several key assumptions, including a flat oil price of $60 per barrel throughout the project's life, consistent production rates as detailed in the operational plan, and carefully estimated CAPEX and OPEX. The decision to use a flat oil price, though conservative, aligns with standard practices in financial modeling for oil and gas projects, as seen in previous studies (Li et al., 2019); This approach ensures that the analysis remains realistic and not overly optimistic, reflecting a cautious estimation of potential returns (Sholeh, 2023). The adoption of conservative price assumptions is also supported by the findings of (Humphrey & Dosunmu, 2017), who emphasize the importance of risk aversion in capital budgeting for marginal fields

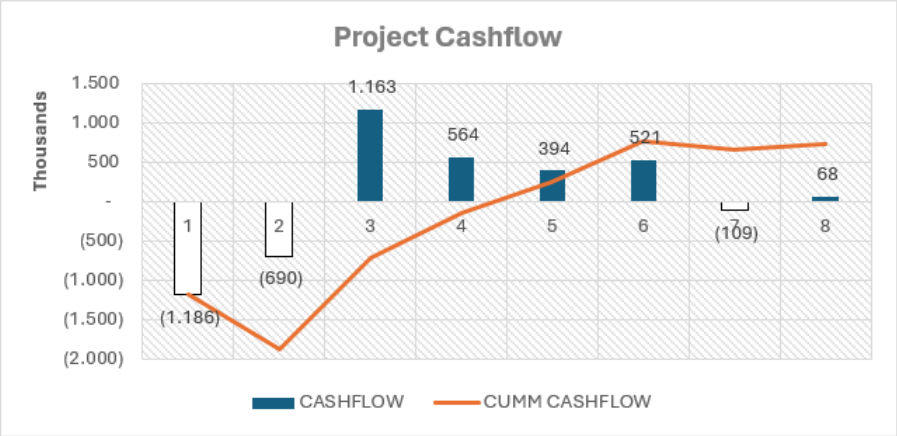

Figure 1. Project Cashflow Diagram

Capital Budgeting Analysis

The capital budgeting analysis reveals a positive NPV of USD 124,462.38, indicating that the project is expected to generate value over its operational life. The IRR of 13.13% exceeds both the WACC of 10.25% and the 10% hurdle rate, confirming the project's financial viability. The PBP of 4 years and 5 months further underscores the project's attractiveness, as it suggests a relatively quick recovery of the initial investment.

Table 2. Capital Busgeting Analysis Result

Net Present Value (10% per Year)	**USD 124.462,38**
IRR (Year)	**13,13%**
PI	**0,96**
PBP	**4 Years 5 Months**

These findings suggest that the ALPHA Field project is financially sound, with the potential to generate significant returns for PT Utama. The positive NPV indicates that the project is expected to add value, while the IRR and PBP provide additional confidence in the project's financial viability.

The capital budgeting analysis is conducted using standard financial metrics, including NPV, IRR, and PBP. These metrics provide a comprehensive view of the project's financial health and help decision-makers assess the potential risks and returns associated with the investment.

Sensitivity Analysis

The sensitivity analysis identifies oil prices and production rates as the most critical variables affecting the project's financial outcomes (Wibowo, 2020). Even slight changes in these variables can lead to significant variations in NPV, highlighting the importance of effective risk management strategies to mitigate potential adverse impacts.

The sensitivity analysis provides valuable insights into the project's risk profile, helping to identify the key factors that need to be closely monitored and managed (Sholeh, 2023). By

understanding how changes in these variables affect the project's financial outcomes, PT Utama can develop strategies to mitigate potential risks and enhance the project's overall viability.

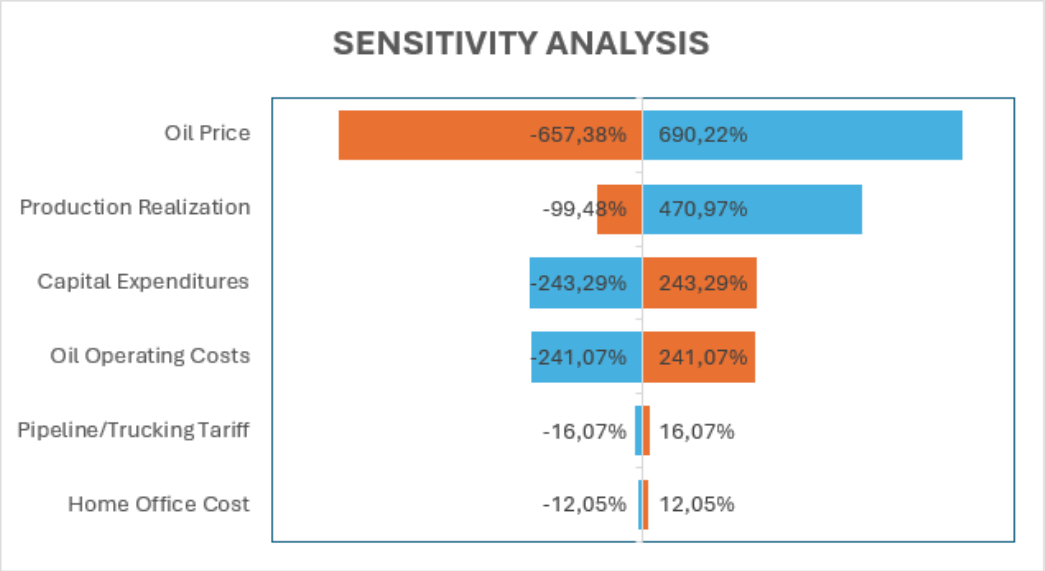

Figure 2. Tornado Chart Result

The sensitivity analysis is conducted by varying each key variable by a certain percentage above and below its base case value. This approach provides a detailed examination of how each variable affects the project's financial outcomes, helping to identify the critical factors that need to be managed to ensure the project's success. In line with previous research, the sensitivity analysis conducted in this study confirms that variations in oil prices and production rates can significantly affect project profitability. By identifying these variables as key risk factors, the study reinforces the conclusions drawn by (Mota & Moreira, 2015) who also emphasize the necessity of monitoring and managing these critical financial determinants to safeguard long-term project viability.

CONCLUSION

Based on a capital budgeting analysis with a 10% discount rate, the ALPHA Field Joint Operation project was found to be financially viable. The project shows a positive NPV, an IRR that exceeds the WACC of 10.25%, and a reasonable payback period, making it a promising investment for PT Utama. Sensitivity analysis confirmed the importance of managing key variables such as oil price and production rate to maintain the long-term profitability of the project. This study provides a comprehensive financial analysis of the ALPHA Field project, which supports the decision to proceed with the investment with the caveat that effective risk management strategies must be implemented. In addition, this study emphasises the importance of conducting thorough financial and sensitivity analyses when evaluating investments in

marginal oil fields. The findings provide valuable insights for decision-makers in the oil and gas industry.

In light of these findings, several recommendations are proposed. PT Utama should proceed with the investment in the ALPHA Field Joint Operation project due to its financial viability. To mitigate risks such as oil price fluctuations and production variability, PT Utama should implement risk management strategies like hedging and process optimization. Key variables such as oil prices and production rates should be continuously monitored, and the project's financial metrics regularly reassessed to adapt to changing market conditions. Leveraging industry expertise and advanced technology will further enhance project profitability. Following these recommendations will maximize the project's potential and support PT Utama's strategic goals.

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