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## Strategies for Operational Cost Efficiency in Power Supply Provision at SKA Field of PT Pertamina EP Zone 11 Regional 4

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**Abstract:** SKA Field is one of the oil and gas fields owned by PT Pertamina EP (PEP), located in Bojonegoro, East Java. As a brown field experiencing natural production decline, its oil output decreased from 8,212 BOPD in 2020 to 4,498 BOPD in 2024, resulting in higher production costs. The field is also affected by volatility in global crude oil prices and the depreciation of the Indonesian rupiah, which further increases operational expenses. The largest component of SKA Field's operational expenditure is the cost of power supply, amounting to IDR 1,468,082,803 per month. This study aims to identify the factors contributing to high power supply costs and to analyze potential strategic alternatives to improve cost efficiency in power operations. The methodology includes a qualitative descriptive approach supported by strategic management analysis through interviews with Pertamina EP and PLN management, combined with quantitative comparisons of net present value (NPV) for several strategic options. The analysis employs the Cause-and-Effect Diagram, SWOT Analysis, IFE Matrix, EFE Matrix, and QSPM Matrix. The results indicate that a synergy strategy between Pertamina EP and PLN has the potential to reduce operational costs while improving power supply reliability to support production activities in SKA Field.

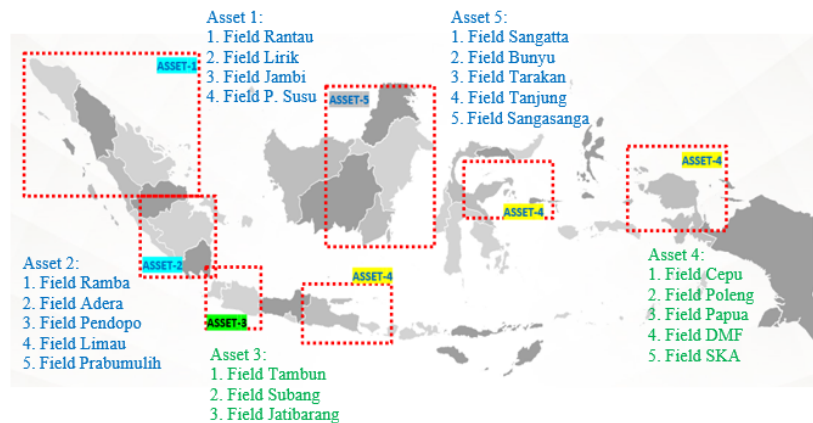
**Keywords:** Cost Efficiency, Strategic Management, SWOT Analysis, Synergy, QSPM Matrix.

### INTRODUCTION

The oil and gas industry holds a strategic role in the global economy, particularly in meeting energy demands and supporting various industrial sectors. In Indonesia, this sector is managed by numerous national and international companies engaged in upstream exploration and production activities. One of the leading companies in this sector is PT Pertamina EP, established on September 13, 2005. Pertamina EP is a subsidiary of PT Pertamina (Persero) operating under the Upstream Subholding (SHU) PT Pertamina Hulu Energi (PHE). As a Cooperation Contract Contractor (KKKS) supervised by the Special Task Force for Upstream Oil and Gas Business Activities (SKK Migas), Pertamina EP is responsible for exploration, field management, and oil and gas production to support national energy security.

Pertamina EP is headquartered on the 12th floor of the RDTX Square Building, Jl. Prof. DR. Satrio No. 26, Karet Semanggi, Setiabudi District, South Jakarta. The company manages

a working area of approximately 140,000 km<sup>2</sup> spread across various regions of Indonesia, as illustrated in Figure 1 below.

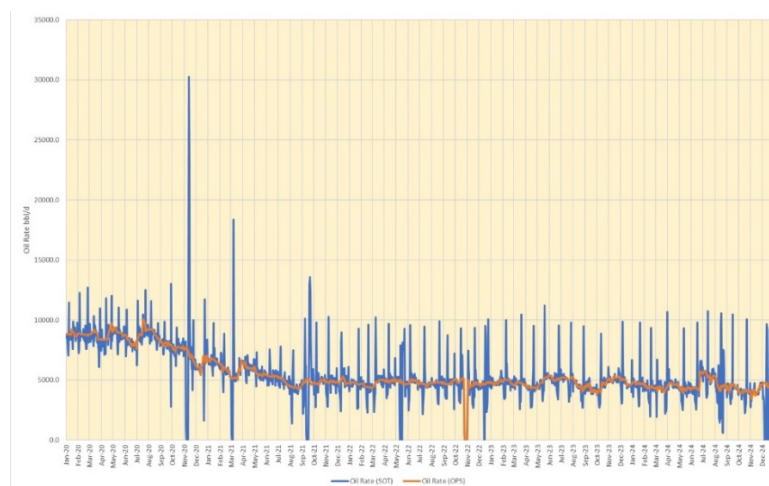


**Figure 1. Mapping of Operational Area PT Pertamina EP**

One of the fields operated by PEP is the SKA Field, located in Bojonegoro Regency, East Java Province. The field was discovered in 2001 and began production in 2004. Pertamina EP currently faces several major challenges within Indonesia’s upstream oil and gas industry, including the following:

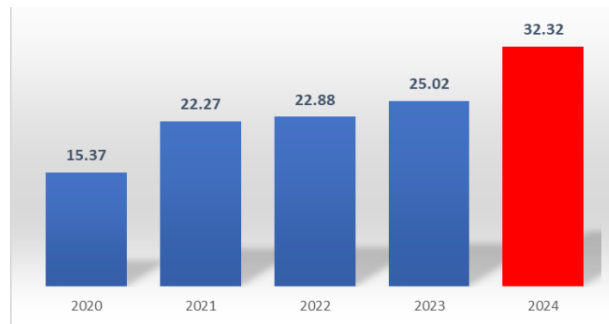
**a. Degradation of Production**

SKA Field falls into the category of a brown field, characterized by a natural decline in production after operating for an extended period. This condition is supported by production report data from 2020 to 2024. In 2020, SKA Field recorded a production level of 8,212 BOPD, which continuously declined to 4,498 BOPD by 2024. The rate of production decline in SKA Field is illustrated in Graph 1 below.



Source: SKA Field Production Report  
**Figure 2. SKA Field Oil and Gas Production Profile**

The direct impact of this production decline is an increase in oil and gas production costs. Based on the SKA Field Financial Report, production costs in 2020 were recorded at USD 15.37 per barrel and continued to rise, reaching USD 32.32 per barrel in 2024.



**Figure 3. Cost of Production SKA Field 2020-2024**

**b. Fluctuation of Crude Oil Price**

Another challenge faced in the industry is the fluctuation of global crude oil prices. Crude oil prices serve as the primary driver of revenue in the upstream oil and gas sector. However, over the past 20 years, crude oil price movements have been highly unpredictable. These fluctuations can be observed in Figure 5, which illustrates the historical trend of global crude oil prices (USD per barrel). In April 2020, crude oil prices reached their lowest point at USD 20.66 per barrel, then rebounded to their peak of USD 117.62 per barrel in June 2022. The implication of such volatility is that oil and gas companies enjoy substantial profits when crude oil prices are high, but conversely, they incur significant losses when prices decline.



Source: <https://www.investing.com/commodities/crude-oil>

**Figure 4. Trend of Global Crude Oil Price**

**c. Decrease of Rupiah Exchange Rate**

The last challenge is the weakening of the rupiah exchange rate against foreign currencies. The profile of the weakening of the rupiah exchange rate against foreign currencies shows in Figure 5.



Source: <https://id.investing.com/currencies/usd-idr-chart>

**Figure 5. Trend of Rupiah Exchange Rate (IDR/USD)**

The depreciation of the Indonesian rupiah also places significant pressure on operational expenditures (Opex) within the oil and gas industry in Indonesia. The impact of this depreciation is reflected in the rising costs of various supporting components in the upstream sector, such as imported materials (spare parts, chemicals, technology, equipment, and others), foreign contractor services (rig rentals, drilling services, well services, seismic and geophysical survey services, etc.), as well as the increased debt burden associated with loans denominated in US dollars.

To address the aforementioned challenges, Pertamina EP must implement appropriate mitigation strategies to manage risks and maintain competitiveness amid global economic pressures. These mitigation strategies are outlined in the 2023 Business Strategy of the Upstream Subholding PT Pertamina Hulu Energi (PHE). One of the key business strategies is Strategic Pillar #4: Competitiveness, which emphasizes cost leadership through cost efficiency across all operational activities, as well as the expansion of digitalization and automation.

As part of the implementation of Strategic Pillar #4: Competitiveness — specifically the Cost Leadership initiative through cost efficiency across all activities — SKA Field has undertaken operational cost-efficiency measures in its oil and gas lifting operations. The first step taken was mapping the components of the operational expenditure budget in SKA Field. In the oil and gas industry, the Operational Expenditure Budget—commonly referred to as ABO—is a spending plan that covers all aspects directly related to production operations, ranging from exploration to the distribution of final products (Lazuardi, 2022).

Based on the Recap of the Operating Cost Budget (ABO) of Field SKA for the 2023-2024 period, it is recorded that there are 3 jobs with the highest operating costs, namely:

#### **a. Job in Power Supply**

Power supply operations refer to activities carried out to provide electrical power for production operations in SKA Field, particularly to supply electricity to wells equipped with artificial lift systems. The type of artificial lift used in SKA Field is the Electrical Submersible Pump (ESP). At present, the power supply for SKA Field's production wells is provided by DEG, which are packaged under the same contract as the ESP rental agreement. The components of the power supply cost include the rental of ESP units along with operator services, as well as the cost of diesel fuel. The total monthly operational cost for power supply provision amounts to IDR 1,468,082,803.

A reliable power supply is essential to support the performance of ESP systems. This is consistent with the findings of Al-Ballam (2022) at the Kuwait Oil Company, which reported that the highest cause of ESP failures (61%) was attributed to power supply failures.

#### **b. Job in Injection Pump Rental**

In oil and gas production operations, produced water is one of the by-products generated during the extraction and processing of hydrocarbons. The volume of produced water increases significantly as oil and gas wells mature (Effendi et al., 2020). This water may originate from natural geological formations or from previously injected water used to enhance oil recovery. The composition of produced water is typically complex, containing a mixture of saline water, hydrocarbon residues, heavy metals, naturally occurring radioactive materials, and various chemicals used during production processes.

The management of produced water presents a significant challenge in oil and gas operations. One common method is the reinjection of produced water into geological formations, either for disposal purposes or to enhance oil recovery through a process known as waterflooding. In this reinjection process, injection pumps are required, which are typically obtained through rental mechanisms.

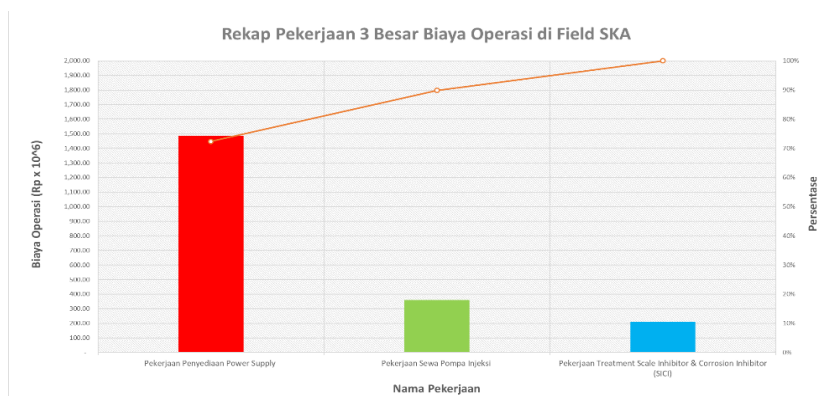
**c. Job in Treatment Scale Inhibitor and Corrosion Inhibitor**

The produced water in SKA Field contains a relatively high concentration of H<sub>2</sub>S (estimated at 13%) as well as scale-forming minerals (Febrian et al., 2022). Therefore, the use of scale inhibitors and corrosion inhibitors is required. A scale inhibitor is a chemical used to prevent the formation of scale, ensuring that production facilities such as pipelines and vessels do not experience blockages. Meanwhile, a corrosion inhibitor is a chemical used to prevent corrosion-related issues, thereby reducing the risk of leaks in production facilities.

The operating costs for the three jobs above in the 2023-2024 period can be summarized in Table 1 and Figure 6.

**Table 1. List of Top 3 Jobs SKA Field Operation Costs**

No	Job Title	Operational costs (Rp × 10 <sup>6</sup> )	Cumulative	%	% Cumulative
1	Power supply provision	1,485.37	1,485.37	72.38%	72%
2	Injection pump rental	358.84	1,844.21	17.49%	90%
3	Treatment scale inhibitor & Corrosion inhibitor (SICI)	208.00	2,052.21	10.14%	100%



Source: Recapitulation of ABO SKA Field 2023-2024  
**Figure 6. Trend in Jobs Cost Production SKA Field**

Based on the data presented in the preceding tables and graphs, the largest component of operational expenditure in SKA Field is the power supply operation, amounting to IDR 1,468,082,803 per month. Therefore, to achieve operational cost efficiency, efforts must be made to reduce the costs associated with power supply operations.

Therefore, based on the issues described above, this study aims to: a) Identify the key factors contributing to the high operational costs of power supply provision in SKA Field, b) Identify potential strategic alternatives for implementing operational cost-efficiency initiatives in power supply provision, taking into account the internal and external factors of SKA Field, c) Analyze several strategic alternatives, both qualitatively and quantitatively, to provide recommendations for the most effective strategy in reducing operational costs related to power supply provision.

This study presents a novel and integrated approach to operational cost optimisation in the oil and gas industry by focusing on electricity supply efficiency at the SKA Field. The novelty lies in the comprehensive integration of technical, economic, and managerial analyses through the combined use of SWOT, IFE-EFE, AHP, and QSPM to formulate and prioritise strategic alternatives, followed by a 10-year Net Present Value (NPV) analysis to ensure long-term investment feasibility. By directly comparing two electricity supply strategies using both

strategic and financial perspectives, this research provides a more holistic decision-making framework than prior studies. Notably, the identification of a synergistic strategy between state-owned enterprises, Pertamina and PLN, as the most optimal solution represents a distinctive contribution, offering a replicable model for strategic energy cost optimisation in upstream oil and gas operations.

## Literature Review

In analyzing the operating cost efficiency strategy in the work of providing electricity supply in the SKA Field, several strategic management analysis techniques can be used, namely:

### a. Cause and Effect Diagram

The Cause-and-Effect Diagram is a powerful yet simple tool used to identify the root causes of problems within a process or system. By structurally analyzing contributing factors, organizations can gain a deeper understanding of the underlying issues and take more effective actions to correct problems or improve quality. The Cause-and-Effect Diagram—also known as the Ishikawa Diagram or Fishbone Diagram—is a visual tool used to identify, analyze, and organize the potential causes of a particular problem or effect. It is widely used in quality management to uncover root causes, enabling more effective problem resolution.

### b. Strategy Formulation

According to David and David (2017), the methods used in strategy formulation can be divided into three stages of decision-making, namely the input stage, the matching stage, and the decision stage.

The first stage is the Input. At this stage, fundamental information is gathered before the strategy formulation process begins. The information collected includes analyses of various internal and external factors that influence the company. The results of these analyses are then presented using tools such as the Competitive Profile Matrix (CPM), the External Factor Evaluation (EFE) Matrix, and the Internal Factor Evaluation (IFE) Matrix. The primary objective of this stage is to obtain the data and insights necessary to support the strategic planning process.

The second stage is the Matching. In this stage, the information collected and analyzed during the previous phase is utilized to develop a set of strategic alternatives. The matching process is carried out using various analytical tools such as SWOT Analysis, the Internal–External (IE) Matrix, and the SWOT Matrix (Strengths, Weaknesses, Opportunities, and Threats). The objective of this stage is to generate a range of strategic options by integrating the internal and external factors that have been identified.

The third stage is the Decision. In this final phase, the company selects the most appropriate strategy from the set of alternatives formulated in the previous stage. Several tools are used in this phase, including the Internal–External (IE) Matrix, the SWOT Matrix, and the Quantitative Strategic Planning Matrix (QSPM). QSPM facilitates the prioritization of strategies based on an objective and measurable evaluation. The purpose of this stage is to systematically assess the various strategic alternatives by utilizing the information obtained earlier, thereby enabling the selection of the most suitable and implementable strategy.

### c. IFE Matrix and EFE Matrix

Internal Factor Analysis (IFE) is a table used to compile an internal strategy in the form of a company's strengths and weaknesses. The IFE matrix assesses the company's internal environment by analyzing various factors that include strengths and weaknesses (David & David, 2017).

External Factor Analysis (EFE) is a table used during the strategy development process to assess a company's opportunities and threats. The EFE matrix concentrates on external factors such as opportunities and threats that the company cannot control (David & David, 2017).

In the process of preparing the IFE and EFE Matrix, the **determination of weights** for each internal and external factor is carried out using **the Analytical Hierarchy Process (AHP) Method**. This method allows companies to provide a more structured and objective assessment of the factors being analyzed

The stages in making IFE and EFE analyses are as follows:

- a) Identification of Internal and External Business Factors.
- b) Calculating Influence for Each Factor: A value of 0 to 1 is given to both internal and external factors, indicating that they have no importance, and a value of 1 indicates that they are of great importance.
- c) Ranking: Each factor has a different influence on the current strategy. A value of 1 means a very weak influence, a value of 2 means a weak influence, a value of 3 means a strong influence, and a value of 4 indicates a very strong influence.
- d) Weighting and Rating: After each internal and external factor is weighted and ranked, that weight is multiplied by the rating. The weighted values of each factor are then added together to produce the total weighted value.

#### **d. Analytic Hierarchy Process (AHP)**

To calculate weights fairly in the decision-making process, researchers use multi-criteria models such as the Analytic Hierarchy Process (AHP). The purpose of this approach is to ensure that the weights assigned to each criterion or alternative are objective, consistent, and reflective of the relative importance of each element.

The Analytic Hierarchy Process (AHP), developed by Thomas L. Saaty in the 1970s, is a decision-making method designed to assist decision-makers in solving complex problems by breaking them down into multiple hierarchical levels and comparing elements through pairwise comparisons. This method enables decision-makers to evaluate various options based on multiple criteria using both quantitative and qualitative approaches.

An AHP Calculator is a tool or software used to compute priority weights and consistency ratios within the AHP decision-making framework. It simplifies the execution of complex calculations involved in AHP, such as pairwise comparisons, weight computations, and consistency testing. In this project, the AHP Calculator used is the Expert Choice software.

The most commonly used technique in AHP is pairwise comparison, where each element is evaluated relative to others based on its importance toward the objective. This method employs a preference scale ranging from 1 to 9 to assess relative importance. The resulting weights are then calculated using either the eigenvector method or the geometric mean approach. Pairwise comparison is often considered fair because it involves direct relational evaluation and maintains consistency in judgment.

#### **e. SWOT Matrix**

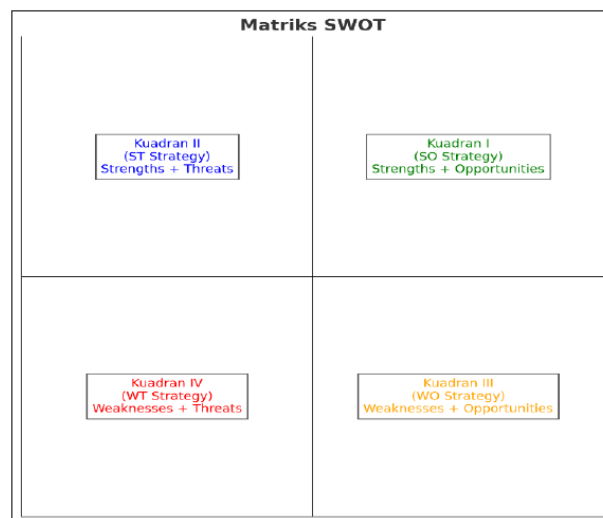
The SWOT Matrix is one of the most widely used strategic analysis tools for evaluating four key organizational elements: Strengths, Weaknesses, Opportunities, and Threats. By utilizing this matrix, companies can gain clearer insights into their current position and formulate effective strategies to achieve predetermined objectives.

After various strategic alternatives are generated based on the four SWOT elements, the next step involves selecting the most appropriate strategy for implementation. This selection process is carried out by evaluating and integrating the factors analyzed during strategy formulation. For example, in determining the value of an SO strategy (which combines Strengths and Opportunities), the weights of strength and opportunity factors derived from the

IFE and EFE Matrices are summed. The strategy with the highest total value among all alternatives is prioritized for implementation.

The structure of the SWOT Matrix is typically arranged in a 2×2 diagram, dividing the analysis into four quadrants based on the combination of internal factors (Strengths and Weaknesses) and external factors (Opportunities and Threats). Each quadrant represents a specific type of strategy that an organization can adopt. Below is an illustration of the SWOT Matrix along with its four quadrants, which depict the various strategic combinations that may be considered:

- a. Quadrant I (SO Strategy or Progressive Strategy) harnesses power to seize opportunities.
- b. Quadrant II (ST Strategy or Diversification Strategy) uses force to deal with threats.
- c. Quadrant III (WO Strategy or Turnaround Strategy) addresses weaknesses to take advantage of opportunities.
- d. Quadrant IV (WT Strategy or Defensive Strategy) minimizes weaknesses and avoids threats.



Source: Fred R. David, 2009

**Figure 7. SWOT Matrix**

**f. QSPM Matrix**

The QSPM (*Quantitative Strategic Planning Matrix*) is a strategic analysis tool used to evaluate and prioritize identified strategic alternatives, based on their quantitative attractiveness. QSPM allows companies to choose the most effective strategy by using a more objective and measurable approach.

**METHOD**

The research method used in this project is mix method. The main method in this project is a case study employing a qualitative descriptive approach based on strategic management theories, supported by quantitative descriptions through comparisons of the net present value (NPV) of total investment and operational costs across several strategic alternatives. These alternatives are evaluated to determine which option yields the greatest operational cost efficiency. The analysis draws on secondary data from Pertamina EP Tanjung Field, secondary data from SKA Field, secondary data from PLN, and relevant literature. This project utilizes the Cause-and-Effect Diagram to identify problem root causes. Subsequent analysis is conducted using strategic management analytical tools, including the Cause-and-Effect Diagram, the External Factor Evaluation (EFE) Matrix, and the Internal Factor Evaluation (IFE) Matrix for the Input Stage; the SWOT Matrix for the Matching Stage; and the Quantitative Strategic Planning Matrix (QSPM) for the Decision Stage. Then, the data for the Analytical Hierarchy Process in this project was collected from 3 key persons from Pertamina EP Tanjung

Field, SKA Field, and PLN using questionnaire. After that, a cross-checking method was performed on the data obtained to test its accuracy again and verify that there was no doubt about its validity (Daruhadi & Sopiati, 2024). For cross-checking, the researcher using triangulation in this project.

The research steps in this project are illustrated in the diagram below.



Figure 8. Research Step

## RESULTS AND DISCUSSION

### Identify the Main Causal Factors of the Problem

SKA Field is an asset owned by Pertamina EP and consists of two production areas: Wellpad A and Wellpad B. The field has two types of production wells—natural flow wells and artificial lift wells—with a current total oil production of approximately 4,500 barrels of oil per day (BOPD). Artificial lift (AL) wells are those that require artificial lifting mechanisms to bring fluids to the surface due to declining reservoir pressure. The type of artificial lift used in SKA Field is the Electrical Submersible Pump (ESP). This system requires a continuous and reliable power supply as its primary energy source to lift fluids from the well. Consequently, power supply operations represent the largest component of operating expenses (Opex) in SKA Field.

To determine the causes of high operational costs associated with power supply provision, it is necessary to identify both the primary and specific contributing factors. The analytical tool used for this purpose is the Cause-and-Effect Diagram. This diagram is a visual instrument designed to identify, analyze, and categorize potential causes of a problem. The contributing factors that lead to high power supply operational costs can be grouped into four main categories:

#### 1. Method Factors

The power supply in SKA Field is provided by DEG powered by diesel fuel. Each DEG operates as a standalone unit assigned to individual artificial lift wells equipped with Electrical Submersible Pumps (ESP). In terms of procurement, the DEGs used for ESP wells in Wellpad A are company-owned units. Meanwhile, the DEGs in Wellpad B are rented units that form part of a bundled contract together with the ESP rental package.

#### 2. Machine Factor

The natural gas produced from Wellpad A and Wellpad B in SKA Field contains a relatively high concentration of H<sub>2</sub>S contaminants. This prevents the gas from being used as fuel for Gas Engine Generators (GEG). Consequently, the power supply for artificial lift production wells equipped with Electrical Submersible Pumps (ESP) in both Wellpad A and

Wellpad B must rely on DEG powered by diesel fuel. The daily diesel fuel consumption for these operations is approximately 2,716 liters.

### 3. Material Factor

DEG require spare parts for operational and maintenance purposes. Operational spare parts include components such as fuel filters and water separator filters. Meanwhile, maintenance-related spare parts, which must be replaced periodically, include engine oil, oil filters, and air filters.

### 4. Human Factor

The operation and maintenance of DEG require both operators and technicians. Operators are needed to monitor DEG operations periodically over a 24-hour cycle, while technicians are responsible for performing maintenance activities in accordance with the manufacturer’s recommended schedule.

These contributing factors can be illustrated using the fishbone diagram (Cause-and-Effect Diagram) shown below.

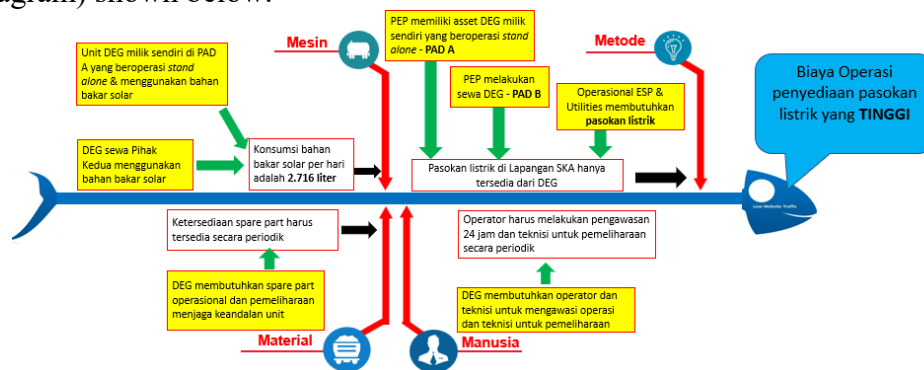
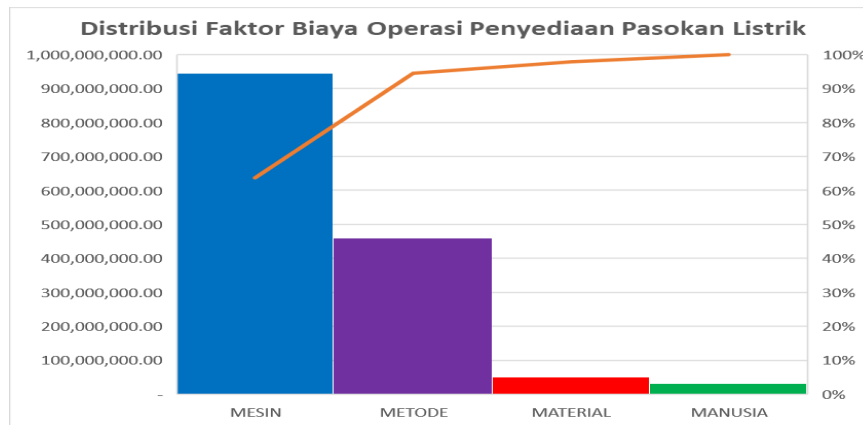


Figure 8. Fishbone Diagram

Furthermore, the contributing factors behind the high operational costs of power supply provision can be quantified to determine the magnitude of their impact on overall expenses. This quantification is conducted by assessing the cost contribution of each factor relative to the total power supply operational cost. The quantified results for these cost drivers are presented in the table and Pareto chart below:

**Table 2. Quantificatiobn of Causative Factor High Operating Costs of Electricity Supply Supply**

No	Main Factor	Specific Cause	Monthly Cost (Rupiah)
1	Method	Monthly DEG rental cost at Wellpad B	459,000,000.00
2	Machine	Diesel fuel cost 2,176 liters per day	944,871,283.57
3	Materials	Spare part costs	50,000,000.00
4	People	Operator and technician costs	31,500,000.00
Total Cost			1,485,371,283.57



**Figure 9. Pareto Quantification of Causal Factors High Operating Costs of Electricity Supply**

Based on Table 2 and Figure 9 above, it can be observed that the largest contributing factor to the high operational costs of power supply provision is the machine factor, primarily due to diesel fuel consumption. The next major contributor is the method factor, driven by the rental costs of DEG. Therefore, in formulating strategies to achieve operational cost efficiency in power supply provision, these two key factors—machine and method—must be addressed as top priorities.

**Identify Potential Alternative Strategies.**

According to David and David (2017), the methods used in strategy formulation can be divided into three decision-making stages: the input stage, the matching stage, and the decision stage.

In the input and matching stages, potential strategic alternatives are identified by analyzing all environmental factors that influence organizational performance or business outcomes. These environmental factors consist of internal factors (Strengths and Weaknesses) and external factors (Opportunities and Threats).

The analytical tools used in the input stage include SWOT Analysis (Strengths, Weaknesses, Opportunities, and Threats), the Internal Factor Evaluation (IFE) Matrix, and the External Factor Evaluation (EFE) Matrix.

**SWOT Analysis**

Based on the results of discussions with the management of Pertamina EP Field SKA and PLN (Persero), some information was obtained that can be poured into the SWOT Analysis as follows:

**Internal**

**Strenght**

**a. Status as a SOE.**

Pertamina EP is a subsidiary of Pertamina (Persero), which is a State-Owned Enterprise (SOE). This status provides Pertamina EP with a strategic position, including access to government support in the form of regulations, fiscal policies, and national energy directives. This position also offers significant leverage in establishing partnerships, securing permits, and safeguarding national interests in energy security. One potential form of collaboration enabled by this status is synergy or partnership among SOEs.

**b. SKA Field as Part of Pertamina EP's Working Area**

Pertamina EP’s working area consists of 22 fields spread across Indonesia, from Aceh to Papua. Each field has its own characteristics, operational challenges, and unique potential. One

of these fields is the SKA Field. Despite their diversity, all Pertamina EP fields share the same objective: to maintain the sustainability of national oil and gas production with reliable, efficient, and safe operational performance.

Collaboration among Pertamina EP fields serves as a major strength in addressing operational dynamics and challenges within the oil and gas industry. This inter-field collaboration is demonstrated when high-performing fields serve as benchmarks for others through knowledge sharing and best practice dissemination. Likewise, fields with more complete resources or operational and production facilities can support other fields through logistical assistance, technical support, or equipment sharing. This collaborative framework enables Pertamina EP's working areas to maintain production stability, optimize resources, and strengthen operational resilience across all regions.

#### **c. SKA Field's positive financial performance**

The financial performance of SKA Field has shown positive results. According to the 2024 financial report of SKA Field, the field recorded a net profit of USD 27,019,336 with a Net Profit Margin (NPM) of 22.37%. This positive NPM provides SKA Field with the financial capacity to fund investments aimed at maintaining and increasing its production levels.

#### **d. SKA Field Work Area in Bojonegoro City.**

The SKA Field working area is located within Bojonegoro City, specifically behind the Dr. R. Sosodoro Djatikoesoemo Regional General Hospital. While this location presents certain challenges, it also offers notable advantages—particularly the ease of accessing the PLN electricity network and the likelihood of receiving priority service due to its proximity to government centers and key public facilities in Bojonegoro. The distance between the 500 kV Java–Bali Substation and Wellpad B is approximately 7 kilometers.

### **Weakness**

#### **a. Production Decline**

SKA Field is classified as a brown field, characterized by a natural production decline after operating for an extended period. This condition is supported by production report data from 2020 to 2024. In 2020, SKA Field recorded an output of 8,212 BOPD, which steadily decreased to 4,498 BOPD by 2024.

The direct consequence of this production decline is an increase in oil and gas production costs. According to the SKA Field Financial Report, production costs rose from USD 15.37 per barrel in 2020 to USD 32.32 per barrel in 2024.

#### **b. Natural Gas Production in the SKA Field has high H<sub>2</sub>S contaminants**

The natural gas produced from Wellpad A and Wellpad B in SKA Field contains a relatively high concentration of H<sub>2</sub>S contaminants. As a result, it cannot be used as fuel for Gas Engine Generators (GEG). Consequently, the power supply for artificial lift production wells equipped with Electrical Submersible Pumps (ESP) in both Wellpad A and Wellpad B must rely on DEG powered by diesel fuel.

#### **c. Location of Wellpad A and Wellpad B near residential.**

The production well areas in SKA Field, specifically Wellpad A and Wellpad B, are located near residential neighborhoods. Therefore, if SKA Field were to construct dedicated power generation facilities, they would need to be equipped with adequate noise-reduction systems for the generator sets (gensets) to prevent complaints from residents living near the production wells.

**External Opportunities**

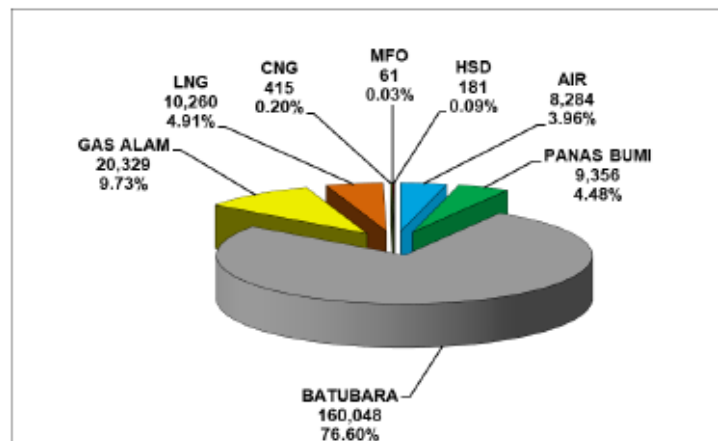
**a. Reserve of PLN Generating Capacity of the Java-Bali System.**

The SKA Field working area is located very close to a PLN (Persero) substation, with a distance of only about 7 km. According to the 2022 Java–Madura–Bali System Operation Evaluation Document, the Java–Bali System’s Net Generating Capacity (DMN SJB) is reported at 42,168 MW, while the recorded peak load is 29,041 MW. This indicates that the PLN Java–Bali system has an available reserve capacity of approximately 13,127 MW.

Primary energy production in the Java–Bali System reached 208.935 GWh in 2022, with a growth rate of 6.03%, exceeding the ROT target of 3.55%. The system also recorded a Coincidence Factor (CF) of 56.56%. The detailed composition of primary energy production in the Java–Bali System (SJB) is presented below.

**Table 3. Production per Primary Energy 2022 PLN (Persero)**

ENERGI PRIMER	Real 2022 [GWh]	ROT 2022 [GWh]	Real 2021 [GWh]	Tumbuh [%]
PLTA	8,284	7,179	6,698	23.67%
PLTP	9,356	9,452	9,506	-1.57%
Batubara	160,048	150,648	145,819	9.76%
BBG	20,329	16,837	23,552	-13.68%
LNG	10,260	17,464	9,820	4.48%
CNG	415	1,770	574	-27.65%
Surya	0	26	0	-
<b>Jml. Non BBM</b>	<b>208,692</b>	<b>203,377</b>	<b>195,969</b>	<b>6.49%</b>
MFO	61	237	236	-74.02%
HSD	181	424	840	-78.43%
<b>Jml. BBM</b>	<b>243</b>	<b>660</b>	<b>1,077</b>	<b>-77.46%</b>
<b>Sistem</b>	<b>208,935</b>	<b>204,037</b>	<b>197,045</b>	<b>6.03%</b>



**Figure 10. Composition of Primary Energy Production 2022**

Based on the tables and charts illustrating PLN’s primary energy production composition in 2022, it can be observed that although coal remains the dominant source of primary energy, PLN (Persero) also generates renewable energy—specifically geothermal, hydropower, and solar energy—with a production share of 8.44%.

Geothermal energy is supplied by the Kamojang Geothermal Plants (Units 1–3 and 4–5), the Drajat Geothermal Plants (Unit 1 and CGI Units 2–3), the Gunung Salak Geothermal Plants (Units 1–3 and DSPL Units 4–6), the Wayang Windu Plants (Units 1–2), the Dieng Geothermal Plant, the Patuha Geothermal Plant, and the Karaha Bodas Geothermal Plant.

Hydropower is generated from PLTA Saguling, Sutami, Cirata, Jatiluhur, Brantas, and Mrica, as well as the Rajamandala Hydropower Plant and various small-scale hydropower units owned by PJB and IP across the UP2B Jakarta & Banten to UP2B East Java areas.

To increase the absorption of the Net Generating Capacity (DMN) within the Java–Bali System (SJB), PLN introduced a service product known as Extra Facility Service. This service aims to attract large industrial customers to shift from self-supplied power generation to PLN electricity by offering potential energy cost efficiency for major consumers.

The Extra Facility Service also ensures a highly reliable power supply, promoted through the well-known slogan “no dip, no outage.” This means that the service guarantees zero blackouts and zero voltage dips. The Extra Facility Service is targeted at industrial, commercial, and critical facilities that require exceptionally high power reliability.

#### **b. The Existence of the Idlewise Digitalization System in the *Idle Asset Utilization Program* at the Pertamina EP WK.**

The Idlewise Digitalization System is a platform designed to monitor and optimize the utilization of idle assets distributed across Pertamina EP’s Working Areas (WK). This system includes a comprehensive database of all idle assets and provides each field under Pertamina EP with easy access to track and identify available idle assets whenever needed. The idle asset database is updated regularly every six months. Idle assets refer to units or equipment registered as State-Owned Property (BMN) that are currently unused or can be optimized through repurposing. One of the idle assets relevant to this project is an unused generator set (genset) that can potentially be utilized in SKA Field.

#### **c. Technology of *Diesel Rotary Uninterruptible Power Supply (DRUPS)*.**

Diesel Rotary Uninterruptible Power Supply (DRUPS) is an uninterruptible power supply system that combines mechanical energy storage technology (rotary/flywheel) with a diesel generator within an integrated system. This system is designed to ensure a stable and uninterrupted electricity supply even in the event of disturbances or outages from the main power source. DRUPS is commonly used in environments that are highly sensitive to power disruptions, such as data centers, hospitals, airports, and other strategic industrial facilities.

#### **d. Work System DRUPS.**

Under normal conditions, when electricity from the PLN grid is available, the electrical power flows through the DRUPS system via a motor–generator (MG) set. This MG set not only transmits electricity to the load but also keeps the flywheel rotating, allowing it to store kinetic energy. The flywheel functions as a temporary energy reservoir that will be utilized if a power outage occurs.

In the event of an outage, the DRUPS system immediately transfers the stored flywheel energy to the load. This transition occurs within milliseconds, ensuring that the load experiences no interruption. While the flywheel is supplying power, the diesel engine automatically starts, and within a few seconds (typically 5–10 seconds), the diesel engine fully takes over the load and maintains power continuity until the PLN grid is restored.

When PLN power returns, the system automatically transfers the load back to the grid, shuts down the diesel engine, and recharges the flywheel to return it to standby mode.

#### **e. Advantages of DRUPS over conventional UPS**

One of the key advantages of DRUPS is that it does not rely on batteries, unlike conventional UPS systems. Batteries often become the weakest component of a UPS system due to degradation over time, the need for storage space, cooling requirements, and relatively complex maintenance. In contrast, the flywheel is a mechanical device that is more reliable in the long term and has a significantly longer operational lifespan.

DRUPS also provides isolation from power quality disturbances such as voltage spikes, harmonics, and other electrical anomalies from the grid. This is because the MG set acts as a buffer between the incoming grid power and the sensitive equipment on the output side.

In terms of speed, DRUPS delivers true no-break power transfer, meaning there is absolutely no interruption during the transition. This capability is crucial for systems that cannot tolerate even momentary power loss, such as air traffic control systems, banking servers, or hospital operating facilities.

#### **f. Regulation of the Minister of SOEs Number PER-08/MBU/12/2019 of 2019**

The Ministry of State-Owned Enterprises (SOEs) Regulation No. PER-08/MBU/12/2019 on General Guidelines for the Procurement of Goods and Services in SOEs was issued as an update to previous regulations (PER-05/MBU/2008 and PER-15/MBU/2012), which were no longer fully aligned with the increasingly complex and dynamic procurement needs of SOEs. With the implementation of Regulation No. PER-08/MBU/12/2019, the government aims to ensure that procurement processes within SOEs are efficient, transparent, accountable, and supportive of synergy among state-owned companies. In addition, this regulation responds to the need to increase the use of domestic products, create fair business opportunities, and strengthen integrity in procurement—an area that is often vulnerable to irregularities.

One of the key objectives of Regulation No. PER-08/MBU/12/2019 is to promote more strategic, systematic, and measurable synergy among SOE entities. The government recognizes that many SOEs possess products, services, or competencies that complement one another but have not been optimally integrated. Through this regulation, collaboration among SOEs is facilitated via more flexible and synergistic procurement mechanisms, without compromising good governance principles.

### **Threats**

#### **a. Crude Oil Price Fluctuations.**

Crude oil prices serve as the primary driver of revenue in the upstream oil and gas industry. However, over the past 20 years, crude oil price movements have been highly unpredictable. In April 2020, crude oil prices dropped to their lowest point at USD 20.66 per barrel, before rebounding to a peak of USD 117.62 per barrel in June 2022. Such volatility significantly impacts oil and gas companies, enabling substantial profits when prices are high but causing financial losses when prices decline.

#### **b. Weakening of the Rupiah Exchange Rate against Foreign Currencies.**

The depreciation of the Indonesian rupiah also places significant pressure on operational expenditures (Opex) within the oil and gas industry in Indonesia. This impact is reflected in the rising costs of various supporting components in the upstream sector, such as imported materials (spare parts, chemicals, technology, equipment, and others), foreign contractor services (rig rentals, drilling services, well services, seismic and geophysical survey services, etc.), as well as the increased debt burden resulting from loans denominated in US dollars.

### **Internal Factor Evaluation (IFE) Matrix**

In the SWOT analysis, internal factors, both strengths and weaknesses and external factors, opportunities and threats of SKA Field have been identified. This identification was carried out based on interviews with the management of PEP SKA Field and the management of PLN (Persero).

The factors identified were then further analysed using the IFE and EFE frameworks through the following stages:

#### **A. Weighting**

Weighting is carried out to determine the level of influence or importance of each factor on the company’s strategy in achieving its expected targets. The weighting process was conducted by distributing questionnaires to Subject Matter Experts (SMEs) within Pertamina EP. The questionnaire results were then processed using the Analytical Hierarchy Process (AHP) Expert Choice software.

**B. Rating**

Ratings ranging from 1 to 4 are used to assess how effectively the company performs on each internal factor, as well as how well the company responds to external factors.

Here are the 4 categories of internal and external factor ratings in the IFE and EFE matrices:

**a) Rating 4 – Excellent:**

**IFE:** In the IFE analysis, a rating of 4 is given if the company **is very strong** in certain internal factors that indicate that the company excels at leveraging those strengths or managing weaknesses very well.

**EFE:** In EFE's analysis, a rating of 4 is given if the company **is very effective in responding to** opportunities or facing external threats. This signifies the company's high ability to utilize external factors.

**Rating 3 – Good:**

**IFE:** In the IFE analysis, a rating of 3 means that the company **is strong enough** in certain factors. This factor provides an advantage, although there is still room for improvement.

**EFE:** In EFE's analysis, a rating of 3 indicates that it has **a good response** to opportunities or threats, but is not entirely optimal.

**b) Rating 2 – Poor:**

**IFE:** In the IFE analysis, a rating of 2 indicates **a fairly weak** internal factor. This indicates that the company has not leveraged certain strengths or has not dealt effectively with weaknesses.

**EFE:** In EFE's analysis, a rating of 2 is given when the company is not **responding effectively enough** in taking advantage of opportunities or managing threats, so there needs to be an improvement in external strategies.

**c) Rating 1 – Very Poor:**

**IFE:** In IFE's analysis, a rating of 1 indicates that the company **is very weak** in these internal factors. This is a significant drawback that needs to be addressed to avoid a negative impact on performance.

**EFE:** In the EFE analysis, a rating of 1 means that the company **has failed to respond** to opportunities or manage threats properly, so strategies need to be changed to avoid further risks. Here is the IFE Matrix for SKA Field PEP

**Table 4. IFE Matrix**

S-W	Internal Factor	Weight	Rating	Weight Score
S1	Status as a SOE.	0.198	4	0.792
S2	SKA Field as Part of Pertamina EP's Working Area.	0.159	4	0.636
S3	Positive Financial Performance.	0.263	3	0.789
S4	SKA Field Work Area in Bojonegoro City.	0.153	3	0.459
	<b>Total S</b>	<b>0.773</b>		<b>2.676</b>
W1	Production Decline.	0.076	2	0.152
W2	Natural Gas Production in the SKA Field has high H2S contaminants.	0.085	1	0.085
W3	Location of Wellpad A and Wellpad B near residential.	0.065	2	0.13

S-W	Internal Factor	Weight	Rating	Weight Score
	<b>Total W</b>	<b>0.226</b>		<b>0.367</b>
	<b>Total IFE Matrix</b>	<b>1.00</b>		<b>3.043</b>

Source: Data Processed

Based on the IFE Matrix shown above, the value of the internal PEP factor of the SKA Field shows a total *Strength* (S) of 2.676 and *Weakness* (W) of 0.367. If summed up, the total IFE Matrix reaches 3,043.

The total IFE Matrix of 3,043 shows that:

- C. PEP's internal position is very strong, especially related to its status as a state-owned enterprise and positive financial performance.
- D. PEP Field SKA needs to find breakthroughs both subsurface and *surface* to be able to withstand natural *decline* in production so that the impact of operating cost efficiency on production costs can be felt significantly.

**External Factor Evaluation (EFE) Matrix**

Analysis of external factors includes opportunities and threats. The EFE matrix uses data from the weighting results with calculations using AHP (*Analytic Hierarchy Process*) *Expert Choice* software, the results of which are described in the following table:

**Table 5. EFE Matrix**

O-T	External Factor	Weight	Rating	Weight Score
O1	Reserve of PLN Generating Capacity of the Java-Bali System.	0.295	4	1.180
O2	The Existence of Idle Diesel Engine Generators in Other Fields in Pertamina EP's Working Area.	0.210	4	0.840
O3	Teknologi <i>Diesel Rotary Uninterruptible Power Supply</i> (DRUPS).	0.194	3	0.582
O4	Regulation of the Minister of SOEs Number PER-08/MBU/12/2019 of 2019.	0.180	3	0.540
	<b>Total O</b>	<b>0.879</b>		<b>3.142</b>
T1	Crude Oil Price Fluctuations.	0.065	2	0.130
T2	Weakening of the Rupiah Exchange Rate against Foreign Currencies.	0.056	2	0.112
	<b>Total T</b>	<b>0.121</b>		<b>0.242</b>
	<b>Total EFE</b>	<b>1.000</b>		<b>3.384</b>

Source: Data Processed

Based on the EFE Matrix shown above, the value of the external factor PEP of the SKA Field shows a total of 3,142 Opportunities (O) and 0,242 *Threats* (T). If summed up, the total IFE Matrix reaches 3,384.

The total EFE Matrix of 3,384 shows that there is a considerable opportunity from external factors (Economic, Technological, and Regulatory) that can be used by the SKA Field PEP to be able to achieve the operational cost efficiency target related to the Electricity Supply Supply Work.

**SWOT Matrix**

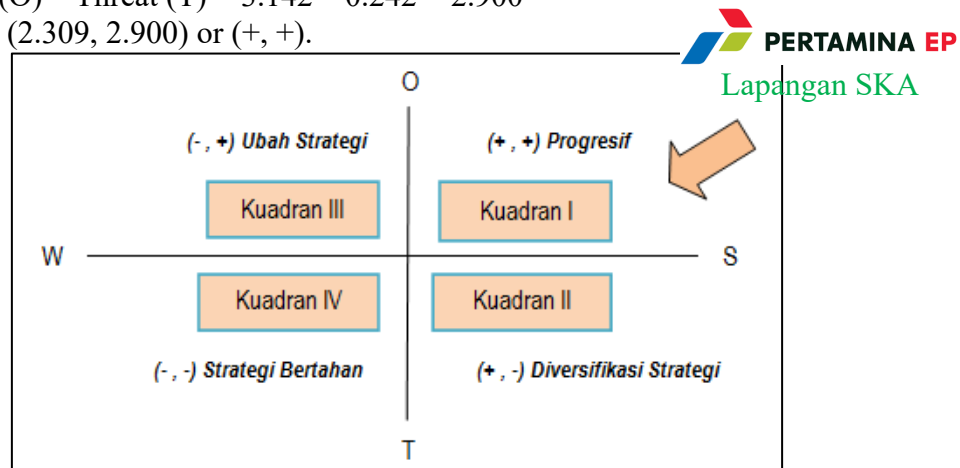
The SWOT Matrix aims to develop a concrete strategy based on internal factors (*Strengths* and *Opportunities*) and external factors (*Opportunities* and *Threats*) that affect the SKA Field PEP that have been identified in the IFE and EFE Matrix above.

The results of the SWOT Matrix data processing for SKA Field PEP are

X-axis: Strength (S) – Weakness (W) = 2.676 – 0.367 = 2.309

Y-axis: Chance (O) – Threat (T) = 3.142 – 0.242 = 2.900

So that (X, Y) = (2.309, 2.900) or (+, +).



**Figure 11. Diagram Kuadran SWOT**

With a total IFE score (S–W) of 2.309 and a total EFE score (O–T) of 2.900, the strategic position of PEP SKA Field falls into Quadrant 1, the “Strength–Opportunities (SO)” quadrant, also known as the progressive strategy. This indicates that SKA Field possesses strong internal capabilities that can be optimally leveraged to take advantage of external opportunities.

The strategy recommended for this quadrant is to capitalize on the company’s internal strengths in order to exploit external opportunities, enabling the organization to achieve optimal benefits. In the context of operational cost-efficiency strategies for power supply provision, PEP SKA Field can leverage its strengths—such as its status as a State-Owned Enterprise (SOE) and its strategic geographical location—to capitalize on external opportunities, including PLN’s substantial reserve generation capacity, advancements in DRUPS technology, and regulatory support for SOE synergies. These elements collectively enable the field to pursue efficiency targets in its power supply operations.

Based on the internal strengths and external opportunities identified, the strategic alternatives that can be pursued by PEP SKA Field include:

**a) Idle Asset Utilization Strategy in the form of Diesel Engine Generator in the Pertamina EP Working Area.**

Based on a search of the IDLEWISE Dashboard, it was found that there is a *Diesel Engine Genset* that has an idle status in the Limau Field which can be used by the SKA Field for electricity supply work.

**b) Synergy Strategy between SOEs PEP – PLN.**

Synergy between SOEs, namely Pertamina EP and PLN (Persero), is a strategy that can be carried out by PEP Field, SKA and PLN (Persero) with the principle of mutual benefit for both parties. This is supported by factors that require each other in both of the following:

PT Pertamina EP SKA Field

1. The need for more efficient electricity supply compared to sourced from *Diesel Engine Gensets*.
2. The need for technology that can maintain a reliable electricity supply without flickering and going out.

PT PLN (Persero)

1. The need for additional burdens from new consumers to be able to absorb the excess capacity they have.

The next step is to analyze the 2 alternative strategies that have been obtained above, both qualitatively and quantitatively, to obtain the best strategy among the 2 alternative strategies.

**Analyze Alternative Strategies to Get the Best Strategy Recommendations.**

The stage of analyzing alternative strategies to get the best strategy recommendations is also known as the *Decision Stage*. The tools that can be used are:

1. Qualitative method with QSPM (*Quantitative Strategic Planning Matrix*).
2. The quantitative method by calculating the greatest efficiency by comparing the *net present value* (NPV) of investment costs and the least supply supply operating costs for 10 years.

**Quantitative Strategic Planning Matrix (QSPM) Matrix**

The following is the Matrix Analysis of Pertamina EP SKA Field.

**Table 6. QSPM Matrix Analysis**

NO	MAIN FACTORS	WEIGHT	ALTERNATIVE STRATEGY			
			Idle Asset Utilization of WK PEP		Synergy of SOE PEP-PLN	
			AS	TAS	AS	TS
	<b>Strengths</b>					
1	Status as a SOE.	0.198	2	0.396	4	0.792
2	SKA Field as Part of Pertamina EP's Working Area.	0.159	4	0.636	3	0.477
3	Positive Financial Performance.	0.263	4	1.052	4	1.052
4	SKA Field Work Area in Bojonegoro City.	0.153	1	0.153	4	0.612
	<b>Weakness</b>					
1	Production Decline.	0.076	1	0.076	1	0.076
2	Natural Gas Production in the SKA Field has high H2S contaminants so the electricity supply must use DEG that uses <i>diesel fuel</i> .	0.085	1	0.085	4	0.340
3	Location of Wellpad A and Wellpad B near residential.	0.065	2	0.130	2	0.130

NO	MAIN FACTORS	BOBOT	ALTERNATIF STRATEGI			
			Idle Asset Utilization of WK PEP		Synergy of SOE PEP-PLN	
			AS	TAS	AS	TS
	<b>Opportunity</b>					
1	Reserve of PLN Generating Capacity of the Java-Bali System.	0.295	1	0.295	4	1.180

NO	MAIN FACTORS	BOBOT	ALTERNATIF STRATEGI			
			Idle Asset Utilization of WK PEP		Synergy of SOE PEP-PLN	
			AS	TAS	AS	TS
2	The Existence of Idle Diesel Engine Generators in Other Fields in Pertamina EP's Working Area.	0.210	4	0.840	1	0.210
3	Technology of Diesel Rotary Uninterruptible Power Supply (DRUPS).	0.194	1	0.194	4	0.776
4	Regulation of the Minister of SOEs Number PER-08/MBU/12/2019 of 2019.	0.180	1	0.180	4	0.720
	<b>Threat</b>					
1	Crude Oil Price Fluctuations.	0.065	1	0.065	1	0.065
2	Weakening of the Rupiah Exchange Rate against Foreign Currencies.	0.056	1	0.056	1	0.056
	<b>Total</b>			<b>4.158</b>		<b>6.486</b>

Source: Data Processed

The results of strategy selection based on the QSPM Matrix Analysis above show the scoring results as follows:

- A. The total score of the strategy "Idle Asset Utilization of WK PEP" is 4,158.
- B. The total score of the "SOE PEP-PLN Synergy" strategy is 6,486.

Because the results of the QSPM Matrix Analysis score show that the PEP-PLN SOE Synergy strategy has the highest score, the PEP-PLN SOE Synergy strategy is the best strategy in terms of operating cost efficiency in providing electricity supply for Pertamina EP SKA Field. This is because the PEP-PLN SOE Synergy Strategy has the following impacts:

- A. Eliminate reliance on diesel fuel which is the highest causative factor in the operating costs of providing electricity supply.
- B. The need for PEP electricity supply can be met by PLN which has excess generation capacity and is supported by DRUPS technology so that a reliable electricity supply is available.
- C. PEP SKA Field can reduce air pollution generated by the operation of Diesel Engine Genset in providing electricity supply for the SKA Field so as to support the Upstream Subholding agenda of PT Pertamina Hulu Energi, namely the Strategic Pillar #3 Energy Transition - ESG & Decarbonization program.
- D. This SOE synergy is supported by the regulation of the Minister of SOEs which encourages systematic synergy and provides benefits for both parties.

**Net Present Value (NPV) Investment Costs and Operating Costs**

**Net Present Value (NPV) Investment Costs and Operating Costs "Idle Asset Utilization Strategy WK PEP"**

**Investment Costs**

- 1. The cost of mobilizing Idle Assets in the form of 6 (six) units of Diesel Engine Genset from Limau Field to SKA Field is 6 x Rp. 30,000,000 = Rp. 180,000,000.

**Operating Costs**

1. The cost of diesel fuel per day (assuming using average fuel consumption data in the SKA Field for the 2023-2024 period) is 2,716 liters.
2. The price of non-subsidized diesel for the period 01-04 October 2025 is Rp. 21,400.
3. So, the cost of diesel fuel in 1 year is  $365 \times 2,716 \times 21,400 = \text{Rp. } 21,214,676,000$ .
4. Diesel Engine Genset operator services are needed for 4 people at Wellpad A and 4 people at Wellpad B with a wage of Rp. 2,792,320 per month for each operator (In accordance with the Decree of the General Manager of Zone 11). So, the total cost of operator services for 1 year is  $12 \times 8 \times \text{Rp. } 2,792,320 = \text{Rp. } 268,062,720$ .
5. The need for spare parts materials and maintenance services refers to the TVM Trakindo Utama contract for CAT D3304 units, which is Rp. 8,785,348 per unit per month. So, the total cost of materials and maintenance services per year is  $6 \times 12 \times \text{Rp. } 8,785,348 = \text{Rp. } 632,545,056$ .
6. The inflation assumption used in the NPV calculation is 3% per year, based on the average national inflation rate in recent years and relatively stable medium-term inflation projections. So, the total cost of material and maintenance service per year with inflation assumption is Rp. 651,521,408.

The assumptions used include:

1. Interest rate of 5% (in accordance with BI-Rate August 20, 2025).
2. The number of wells for 10 years has not changed.
3. Non-subsidized diesel prices remain fixed.

So based on the data above, we can make a table of investment costs and operational costs for maintenance and operation for 10 years for the "Idle Asset Utilization Strategy of WK PEP" as seen in Table 7 below.

**Table 7. Simulation of Investment and Operating Costs for Alternative Idle Asset Utilization Strategies 6 (six) Diesel Engine Generators.**

No	Description	Year											
		0	1	2	3	4	5	6	7	8	9	10	
1	Mobilization costs for 6 DEG units	180,000											
2	Diesel fuel costs		21,214,676	21,214,676	21,214,676	21,214,676	21,214,676	21,214,676	21,214,676	21,214,676	21,214,676	21,214,676	21,214,676
3	Operator service		268,063	268,063	268,063	268,063	268,063	268,063	268,063	268,063	268,063	268,063	268,063
4	Spare parts and maintenance costs		632,545	632,545	632,545	632,545	632,545	632,545	632,545	632,545	632,545	632,545	632,545
<b>Total annual cost</b>		180,000	22,115,284	22,115,284	22,115,284	22,115,284	22,115,284	22,115,284	22,115,284	22,115,284	22,115,284	22,115,284	22,115,284
<b>Net Present Value (NPV)</b>		180,000	21,062,175	20,059,215	19,104,014	18,194,299	17,327,904	16,502,765	15,716,919	14,968,495	14,255,709	13,576,866	
<b>Total Net Present Value (NPV)</b>		<b>170,948,361</b>											

Note:

\*: All numbers in thousands.

The Total *Net Present Value* (NPV) of investment costs and operating costs of the *Idle Asset Utilization Strategy 6 (six) Diesel Engine Generator* is Rp. 170,948,361,000.

**Net Present Value (NPV) Investment Costs and Operating Costs "SOE Synergy Strategy of PEP-PLN".**

**Investment Cost.**

The investment cost for this strategy consists of:

- A. The Connection Fee (BP) is in accordance with the Minister of Energy and Mineral Resources Regulation No. 27 of 2017, which is Rp. 631 per VA and,
- B. The Subscription Security Deposit (UJL) is in accordance with the Decree of the Board of Directors of PT PLN (Persero) No. 424.K/DIR/2013 concerning the Subscription Security

Deposit (UJL) PT PLN (Persero) which is Rp. 225 per VA for the I-3 customer group (Industry-3).

As for the connection capacity for Wellpad A and Wellpad B respectively is 1,110kVA.

Therefore, the investment costs required in the context of the implementation of the PEP-PLN SOE Synergy Strategy are:

Wellpad A consists of:

1. Connection Fee (BP) of 1,110,000VA x Rp. 631 = Rp. 700,410,000.
2. Subscription Security Deposit (UJL) of 1,110,000VA x Rp. 225 = Rp. 249,750,000.

Wellpad B consists of:

1. Connection Fee (BP) of 1,110,000VA x Rp. 631 = Rp. 700,410,000.
2. Subscription Security Deposit (UJL) of 1,110,000VA x Rp. 225 = Rp. 249,750,000.

### Operating Costs

Operating costs can be calculated by mapping in advance the amount of load on each wellpad as well as the electricity tariff.

Wellpad A load consists of:

1. 4 production wells (SKA-02, SKA-15, SKA-19, and SKA-03) with ESP artificial lift with an average load of 50kW for each well.
2. 2 production water injection pumps with an average load of 150kW per pump.
3. Load utilities sebesar 25kW.

Wellpad B load consists of:

1. 6 production wells (SKA-07, SKA-12, SKA-14, SKA-25, SKA-29, and SKA-37) with ESP artificial lift with an average load of 50kW per well.
2. 2 production water injection pumps with an average load of 150kW per pump.
3. Load utilities sebesar 25kW.

Electricity Tariff for Tariff Group I-3/TM consists of:

1. LWBP tariff of Rp. 1,035.78 per kWh.
2. WBP tariff is K x Rp. 1,035.78 per kWh. If the value of K is 1.5 then, the WBP tariff is Rp. 1,553.67 per kWh.

The Extra Facility Tariff is for additional anti-flicker and anti-fire facilities with DRUPS technology which refers to the Electricity Sale and Purchase Agreement (PJBTL) tariff from Pertamina EP Tanjung Field.

1. The current DRUPS tariff is Rp. 545.86 per kWh.
2. The DRUPS tariff during WBP is Rp. 81.88 per kWh.

**Table 8. Simulation of Investment Costs and Alternative Operations of the SOE-PLN Synergy Strategy for Wellpad A.**

No	Description	Year											
		0	1	2	3	4	5	6	7	8	9	10	
1	Connection fee	700,410											
2	Subscription deposit	249,750											
3	Total regular LWBP rate		3,969,627	3,969,627	3,969,627	3,969,627	3,969,627	3,969,627	3,969,627	3,969,627	3,969,627	3,969,627	3,969,627
4	Total regular WBP		1,190,888	1,190,888	1,190,888	1,190,888	1,190,888	1,190,888	1,190,888	1,190,888	1,190,888	1,190,888	1,190,888
5	Total DRUPS LWBP rate		2,092,008	2,092,008	2,092,008	2,092,008	2,092,008	2,092,008	2,092,008	2,092,008	2,092,008	2,092,008	2,092,008
6	Total DRUPS WBP rate		62,761	62,761	62,761	62,761	62,761	62,761	62,761	62,761	62,761	62,761	62,761
	<b>Total annual cost</b>	950,160	7,315,284	7,315,284	7,315,284	7,315,284	7,315,284	7,315,284	7,315,284	7,315,284	7,315,284	7,315,284	7,315,284
	<b>Net Present Value (NPV)</b>	950,160	6,966,938	6,635,179	6,319,218	6,018,303	5,731,717	5,458,778	5,198,836	4,951,272	4,715,498	4,490,950	
	<b>Total Net Present Value (NPV)</b>		<b>57,436,847</b>										

**Table 9. Simulation of Investment Costs and Alternative Operations of the SOE-PLN Synergy Strategy for Wellpad B.**

No	Description	Year											
		0	1	2	3	4	5	6	7	8	9	10	
1	Connection fee	700,410											
2	Subscription deposit	249,750											
3	Total regular LWBP rate		4,725,746	4,725,746	4,725,746	4,725,746	4,725,746	4,725,746	4,725,746	4,725,746	4,725,746	4,725,746	4,725,746
4	Total regular WBP		1,417,724	1,417,724	1,417,724	1,417,724	1,417,724	1,417,724	1,417,724	1,417,724	1,417,724	1,417,724	1,417,724
5	Total DRUPS LWBP rate		2,490,486	2,490,486	2,490,486	2,490,486	2,490,486	2,490,486	2,490,486	2,490,486	2,490,486	2,490,486	2,490,486
6	Total DRUPS WBP rate		74,716	74,716	74,716	74,716	74,716	74,716	74,716	74,716	74,716	74,716	74,716
<b>Total annual cost</b>		950,160	8,708,672	8,708,672	8,708,672	8,708,672	8,708,672	8,708,672	8,708,672	8,708,672	8,708,672	8,708,672	8,708,672
<b>Net Present Value (NPV)</b>		950,160	8,293,973	7,899,022	7,522,878	7,164,646	6,823,472	6,498,545	6,189,091	5,894,372	5,613,688	5,346,369	
<b>Total Net Present Value (NPV)</b>													

Note:

\*: All numbers in thousands.

The Total Net Present Value (NPV) of investment costs and operating costs of the BUMN PEP-PLN Synergy Strategy for SKA Field PEP is Rp. 125,633,063,000.

Based on the comparison of the *Net Present Value* (NPV) of investment costs and operating costs of the 2 alternative strategies as seen in Table 7, Table 8, and Table 9 above, information was obtained that the **PEP-PLN Inter-SOE Synergy strategy** has the **smallest total NPV of investment costs and operating costs**.

Furthermore, for the comparison, Saudi Arabia is shifting its power generation mix from oil to natural gas, reducing oil consumption for electricity by up to 270,000 barrels per day through conversion programs at major power plants. The Jafurah unconventional gas project is central to Vision 2030, aiming to displace 350,000 barrels per day of crude burn by 2030, which will free up more crude for export and lower operational costs by 6–8 times per kilowatt-hour. Saudi Arabia also targets 72% gas in its power mix by 2030 and is investing \$400 billion in energy projects, balancing oil dominance with low-carbon initiatives (Hidayat, 2025).

Then, in Middle East and North Africa region is endowed with enormous resources of oil and gas, which is reflected in strong economy in this region (Riazi, 2010). The Middle East region has extreme climate (hot and cold), but its modernization is much faster than that of North Africa due to stable economic, which is driven by the availability of fossil fuel resources. However, the regions also known for its political instability and dependence on foreign expertise, technologies, and skilled manpower. So, because of this conditions, The Middle East and North Africa need to start the savings of energy or makes sustainability program (Rana et al., 2017).

After that, the research that has been done by Jarboui & Alofaysan (2024) compare the energy transition and efficiency in state that has the largest oil and gas company. The findings reveal that biofuels, solar and hydropower contribute to promote the operational and environmental efficiency of the largest 20 OGC. However, the analysis suggests that while the global energy transition significantly influences and bolsters environmental efficiency, its effect on operational efficiency among these major OGC remains less pronounced and insufficient.

## CONCLUSION

### Conclusion.

Based on the above discussion, the following conclusions are obtained:

- The biggest main causative factors that cause the high operating costs of providing electricity supply are the Engine Factor due to the consumption of diesel fuel and the Method Factor due to the DEG rental cost.
- Based on the SWOT Matrix, SKA Field PEP is in Quadrant 1 "*Strength - Opportunities*" (SO) or known as the "Progressive" strategy. This condition shows that the SKA Field PEP has good enough internal strength to be able to take advantage of opportunities from external optimally.
- Alternative strategies that can be carried out by PEP Field SKA are:

- 1) Idle Asset Utilization Strategy in the form of *Diesel Engine Generator* in the Pertamina EP Working Area.
  - 2) Synergy Strategy Between SOEs Pertamina EP-PLN (Persero).
- d. The results of the QSPM Matrix Analysis score show that the PEP-PLN Inter-SOE Synergy strategy has the highest score, so the **PEP-PLN Inter-SOE Synergy** strategy is the **best strategy** in terms of operating cost efficiency in providing electricity supply for Pertamina EP SKA Field.
- e. Comparison of Total *Net Present Value* (NPV) of investment costs and operating costs of 2 alternative strategies information obtained that the strategy that has the **smallest Total NPV of investment costs and operating costs** is the **PEP-PLN SOE Synergy Strategy**. The savings that SKA Field can achieve by using the **PEP-PLN SOE Synergy Strategy** amount to Rp. 45,315,298,000 or 26,5% before using **PEP-PLN SOE Synergy Strategy**.

### Recomendation

Based on the conclusions obtained, there are several suggestions that can be conveyed in this study, which are as follows:

- a. The synergy between Pertamina EP and PLN (Persero) SOEs can be implemented in other fields besides Tanjung Field and SKA Field. Therefore, it is necessary to conduct a *Forum Group Discussion* between PEP and PLN (Persero) to be able to map the potential implementation of this synergy in other fields in the Pertamina EP Working Area.
- b. The utilization of *Idle Assets* can be optimized in the Pertamina EP Working Area while still paying attention to economic factors, the needs of production facilities, and the speed of procurement or construction of production facilities.
- c. The implementation of a synergy strategy will encourage policies to reduce diesel fuel consumption and the Diesel Engine Generator (DEG) rental system in the long term. This will have an impact on the stability of operational costs, energy management efficiency, and a reduction in the risk of fuel price fluctuations on oil and gas production costs.
- d. Further research is recommended to focus on the integration of IoT, predictive optimization, and smart grids in managing artificial lift electricity needs. This approach enables real-time monitoring of performance and energy consumption, prediction of power requirements and potential disruptions, and adaptive and efficient electricity distribution management. The application of these concepts is expected to reduce operating costs, improve system reliability, and support digital transformation and the sustainability of upstream oil and gas operations.

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