

Excess Power Management for Industries in Remote Areas: A Case Study of PT Pertamina EP Cepu - Donggi Matindok Field

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ABSTRACT

This study analyzes excess power management at PT Pertamina EP Cepu's Donggi Matindok Field (DMF), where the power plant utilizes only 40% of its installed capacity, leaving 4–6 MW of excess electricity—worth approximately 33.9 billion rupiah annually—unused. The research aims to formulate an optimal business solution to improve power generation efficiency by monetizing this excess power. Using a mixed-method approach, primary data were collected through focus group discussions (FGD) with experts, questionnaires, and interviews, while secondary data included operational reports and technical records. The Kepner-Tregoe decision analysis identified monetizing excess electricity as the most viable improvement area, achieving the highest score of 82.5. Through Value-Focused Thinking, incorporating SWOT and PESTEL analyses, evaluation criteria and alternative solutions were developed. The Analytical Hierarchy Process (AHP), based on expert pairwise comparisons, determined that implementing a power swap scheme with PLN is the optimal solution, with a priority weight of 0.46124. This strategy enables DMF to reduce operational costs, increase revenue, and support national energy efficiency goals while ensuring business sustainability in remote operational areas..

KEYWORDS *excess power, power swap, Kepner-Tregoe, SWOT, PESTEL, Value-Focused Thinking, Analytical Hierarchy Process (AHP).*



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INTRODUCTION

Operating in the energy industry, PT Pertamina (Persero) is one of the largest state-owned enterprises (BUMN) in Indonesia. Pertamina manages the nation's energy resources and strategically supports the fulfillment of Indonesia's overall energy demand. From the exploration and production of oil and natural gas to refining, distribution, and marketing of energy products, as well as the development of new and renewable energy sources, Pertamina operates across a broad and integrated spectrum (Ravikumar et al., 2016; Tan et al., 2014). The corporation also owns subsidiaries and affiliates in petrochemicals, gas, and renewable energy (Hartmann et al., 2021; Yang & Dong, 2016). As Indonesia's leading energy company, Pertamina contributes significantly to state revenue, primarily through its oil and gas operations encompassing exploration, production, processing, and distribution activities (Arifin et al., 2024; Ichsan et al., 2022; Tammala & Sudrajad, 2024).

Since 2021, PT Pertamina (Persero) has established several sub-holdings to oversee its oil and gas businesses. This restructuring aims to improve operational efficiency and increase value creation across subsidiaries. Pertamina formed the Subholding Upstream (SHU) to manage upstream business operations involving oil and gas exploration and production. PT Pertamina Hulu Energi (PHE), through PT Pertamina EP Cepu, oversees Pertamina's upstream activities under this sub-holding. Located in Eastern Indonesia, the Donggi Matindok Field (DMF), managed by PT Pertamina EP, is one of PHE's key domestic operational areas, contributing significantly to output and profitability.

As one of the Kontraktor Kontrak Kerja Sama (KKKS) under SKK Migas, PT Pertamina EP—part of PT Pertamina Hulu Energi—manages the largest oil and gas fields in Indonesia (SKK Migas, 2016; SKK Migas, 2022). Extending from the westernmost region of Sumatra to

Papua, the company operates 22 fields nationwide, including the Donggi Matindok Field, situated on the eastern coast of Sulawesi in Banggai Regency, Central Sulawesi. Operational since 2016, Donggi Matindok Field focuses on the extraction and processing of natural gas resources. The processed gas is supplied exclusively to PT Donggi Senoro LNG (PT DSLNG), which further processes it into LNG products for export.

The Donggi Matindok Field operates two Central Processing Plants (CPP) responsible for gas processing. These plants have raw gas capacities of 60 MMSCFD at CPP Donggi and 65 MMSCFD at CPP Matindok, located approximately forty kilometers apart. Each CPP has an on-site power plant supplying electricity for gas processing operations. Major equipment requiring electrical power includes compressors, pumps, electric heaters, fan coolers, and other critical machinery, along with utilities for residential, office, and public facilities (Grondzik & Kwok, 2019; Kleinert et al., 2016; Mathias et al., 2023). Each CPP operates four Gas Turbine Generators (GTG), each with a nominal capacity of 4.8 megawatts (MW). Operating in a three-active, one-standby configuration, these GTGs function continuously, powered by gas produced on-site. Thus, each CPP has a total installed generating capacity of 14.4 MW—significantly higher than the daily demand of approximately 5–6 MW (about 40% of total capacity). Maintaining GTG units incurs considerable costs—up to USD 500,000 per year for maintenance, excluding fuel and lubricants—with each GTG requiring overhaul every 30,000 operational hours, costing USD 1.6 million per unit.

Donggi Matindok Field must ensure business sustainability by continuously identifying opportunities to enhance production and streamline operations amid an increasingly VUCA (Volatility, Uncertainty, Complexity, and Ambiguity) environment. The field has been ISO 50001 Energy Management System certified since 2022. Efficiency improvements in power generation—through optimized generator operation and load allocation—have reduced primary energy (gas) consumption, GTG operating costs, and CO₂ emissions (Basrawi et al., 2016; Ma et al., 2022; Mahdi et al., 2024). While many PT Pertamina EP fields have entered the “red category,” Donggi Matindok Field remains highly profitable based on economic evaluations. PT Pertamina EP strives not only for profitability but also for alignment with national objectives such as regional economic empowerment and energy sovereignty, particularly in remote and frontier areas. From its inception, DMF has driven local economic development, increased community welfare, and supported the growth of new local enterprises. The resulting population growth has further increased regional electricity demand.

Therefore, continuous efficiency initiatives are essential to sustain business operations. This research aims to analyze excess power management at the Donggi Matindok Field and formulate the most appropriate business solution to optimize power generation efficiency by utilizing available surplus electricity. Specifically, the study seeks to identify potential improvement areas through the Kepner-Tregoe Decision Analysis approach, evaluate alternative solutions considering SWOT and PESTEL aspects using Value-Focused Thinking, and determine the optimal strategy through the Analytical Hierarchy Process (AHP) method based on expert judgment. The findings are expected to provide PT Pertamina EP Cepu Donggi Matindok Field with a comprehensive and actionable framework for monetizing excess power, thereby reducing operational costs, increasing revenue, and supporting national energy efficiency goals. Furthermore, this study contributes to the broader body of knowledge on

excess power management in remote industrial settings, offering valuable insights for similar contexts within the energy sector.

METHOD

In conducting this study, the researcher develops a Conceptual Framework that facilitates comprehension, analysis, and the formulation of strategies to examine critical components, thereby constructing a robust argument to address the issue and establish connections between theory and reality. The study's primary technique entails integrating data from literature reviews, group discussions, questionnaires and interviews to establish and validate the controllable factors. The diagram of the conceptual framework is shown in Fig. 1.

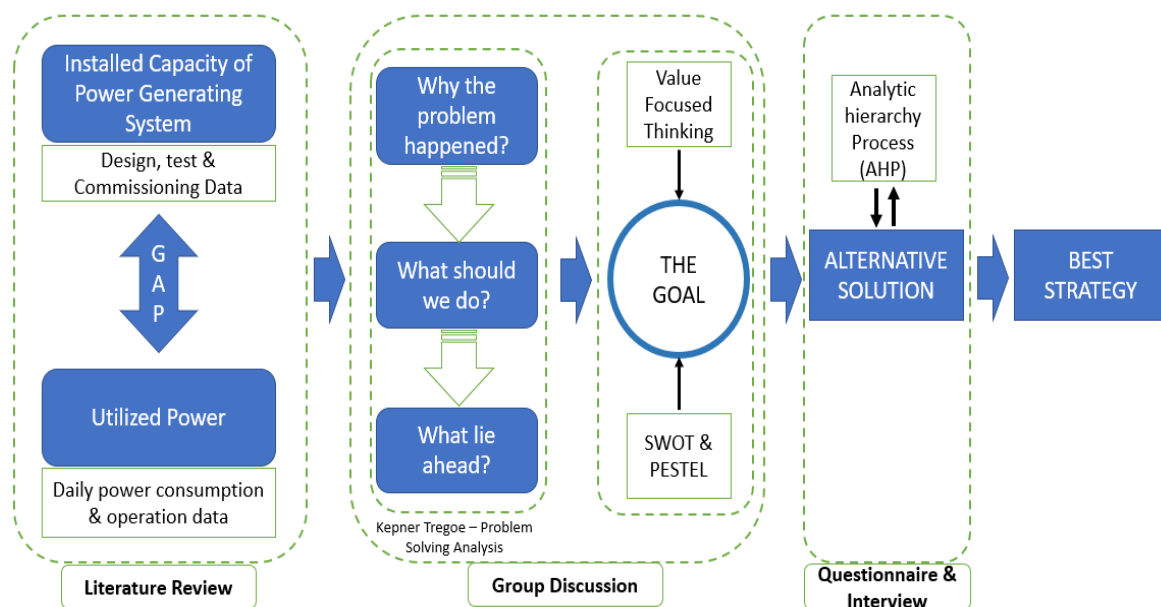


Figure 1. Diagram of research methodology

Source: Author's construction based on research framework, 2026

Research Design

Every element influencing the low efficiency of the Donggi Matindok power generating system was assessed in order to ascertain their effect. Using Kepner-Tregoe Situation Analysis, the author finds the primary issues likely to generate the highest inefficiencies. The author builds a structure for gathering works of literature. Apart from that, further investigation on the author's company issues will also be conducted to perfect this research. Using Value Focused Thinking, the author additionally searches in this stage for further measurements or criteria to gather and evaluate data. The gathered data is examined utilizing the AHP approach, which applies various criteria to determine the optimal solution. The author proposes a business solution to management and ensuring that the business solution meets the expectations of the CEO (Thompson et al., 2022). The author created a business solution implementation plan at the end of the research as shown in Fig. 2.

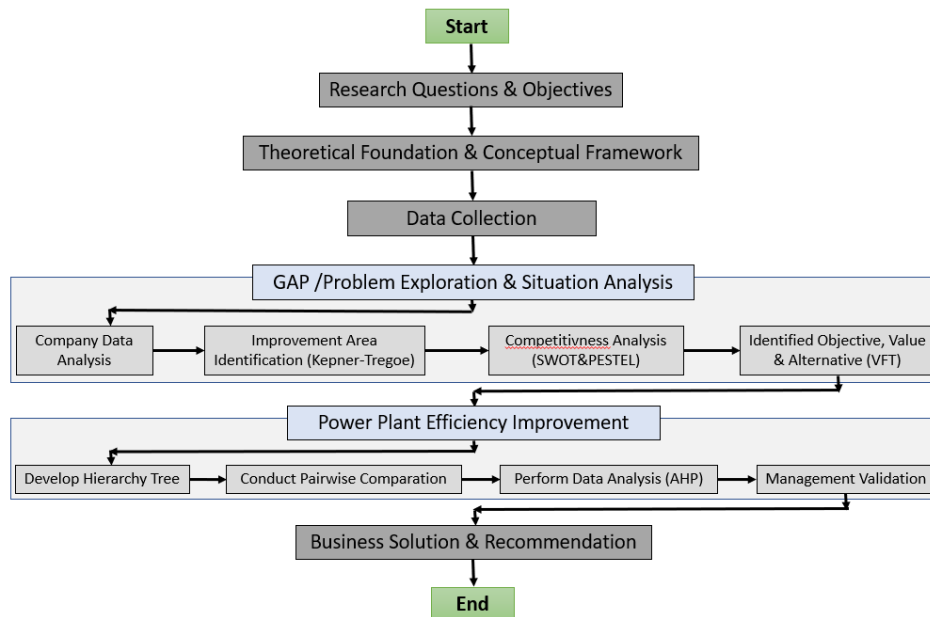


Figure 2. Research Design

Source: Author's construction based on Kepner-Tregoe, VFT, and AHP methodology, 2026

Data Collection Method

This study combines qualitative and quantitative methods using a mixed-methods strategy in data collecting as shown in Fig. 3. By using the advantages of both approaches, this one seeks to give a more thorough and in-depth knowledge of the phenomenon under examination.

While qualitative data will offer deep insights into the context, reasoning, and meanings underlying the data, quantitative data will give a broad picture and statistics regarding the issue being investigated. Based on a more whole knowledge of the current scenario, the integration of these two kinds of data is expected to assist the researcher to develop the problem precisely and offer efficient answers.

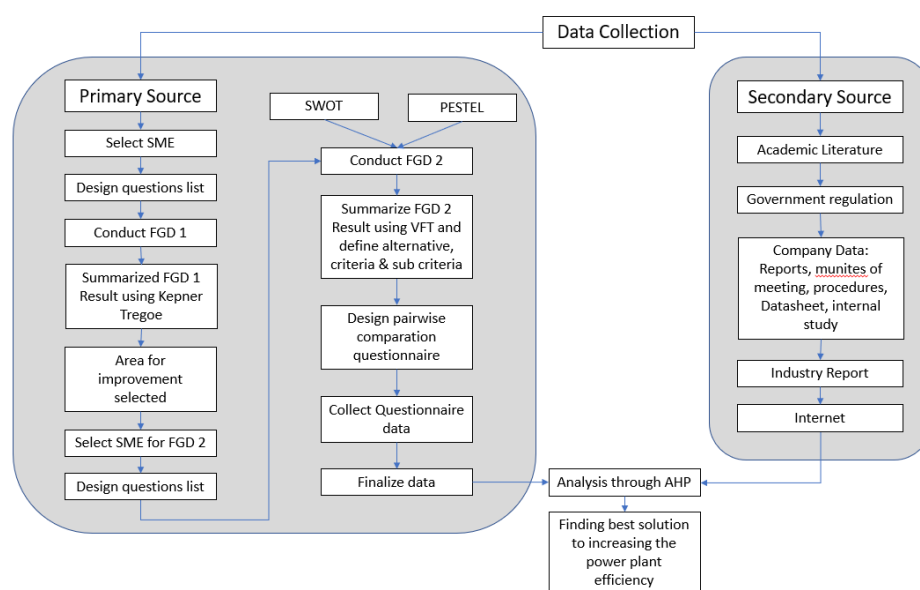


Figure 3. Flow chart of data collection

Source: Author's construction based on Creswell (2014) and Maxwell (2008), 2026)

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This study gathers qualitative data applying the Focus Group Discussion (FGD) approach. FGD is a technique for gathering data whereby a small group of individuals thoroughly explores a given topic or issue. This approach helps to compile participants' opinions, information, skills, and practices revealed via contacts with others. The technique is based upon the assumption that the group process activated during FGD helps identify and clarify shared knowledge among the group, which would be difficult to obtain through a series of individual interviews (Van Eeuwijk & Angehrn, 2017).

The participants in this FGD are PEP employees in departments connected to and related with the primary issue as shown in Table 1, so that accurate and responsible information can be obtained. In an FGD, the researcher's task is to formulate appropriate, concrete, and clear questions to be asked to the respondents, collect their responses, evaluate them, and finally interpret them in such a way that allows for answering broader research questions. A short list (between 6 and 12 items) of concrete questions or discussion points is called an 'interview guide' for an FGD (Van Eeuwijk & Angehrn, 2017).

Table 1. Respondent for FGD-1

Department	Position	Initial
Petroleum Engineering (PE)	Asst. Manager PE	AF
Health, Safety, Security & Environment (HSSE)	HSSE Superintendent	JM
		SY
Budgeting & Planning	Budgeting & Planning Analyst	ZH
Production Operation (PO)	Sr. Spv. Donggi Production	AP
	Sr. Spv. Matindok Production	AK
Reliability, Availability & Maintenance (RAM)	Sr. Spv. Electrical & Instrument	ET
	Sr. Spv. Mechanical	HP
	Sr. Technician Electrical	APA

Source: Research data, FGD-1 participant list, 2026

Then all parties related to the issue participate in group discussion to identify the potential area for follow-up and analyzed to obtain alternative options as solutions to achieve the main objectives.

Value Focused Thinking (VFT) thru discussion groups is used to gain insights by considering SWOT and PESTEL aspects, involving subject matter experts with the necessary knowledge and experience to formulate alternative solutions, criteria, and sub-criteria thru focused group discussions (FGD-2). Profiles of subject matter experts shown in Table 2.

Table 2. Respondent for FGD-2

Stake Holder	Position	Initial
Internal Field	Field Manager	RK
	Asst. Manager PO	RP
	Sr. Spv. Production Matindok	BW
	Asst. Manager RAM	AH
	Sr. Spv. Electrical & Instrument	ET
	Sr. Engineer Electrical	MS
External	Sr. Spv. Electrical & Instrument Jtb	ZC
	Spv. Electrical & Instrument Poleng	AA
	Spv Utilities Jtb	AY

Source: Research data, FGD-2 participant list, 2026

The second FGD will discuss the criteria and alternative solutions for the main problem. It is very important to address the main issue by selecting existing alternatives based on the criteria of needs. To generate alternative solutions, the Value Focused Thinking (VFT) framework is used. The concepts of determining criteria, sub-criteria, and alternatives to be adapted into the implementation program for improving power plant efficiency refers to micro aspects such as strength, weakness, opportunity, and threat. Additionally, macro aspects including political, economic, social, technological, environmental, and legal factors are also considered. The best alternative solution was obtained from the pairwise comparison of the AHP Model based on a questionnaire conducted with several Subject Matter Experts (SMEs) who are closely related to the management of the power generation system in the Donggi Matindok field. An interview with the Senior Manager affirmed the selected alternative solution aligned to management's primary aims.

RESULT AND DISCUSSION

Problem Exploration

The constraint faced in the electricity generation system at the Donggi Matindok Field is that the installed capacity is too large, exceeding the total electrical power required, which leads to inefficiency in the electricity generation system. From the literature study, it is known that the installed gas turbine generators are 4 x 4.8 MW at each CPP (CPP Donggi and CPP Matindok), with an equipment operation pattern of 3 units running and 1 unit standby, meaning that each CPP is capable of generating 14.4 MW of electricity. Meanwhile, the electricity consumption at each CPP is no more than 6 MW or about 40% of the installed generation capacity.

To ensure that this gas turbine generator equipment is capable of generating electricity according to its specification, the author conducted a review of the test and commissioning documents of the equipment, and based on operational data since it was first used, the generator unit has never been loaded to its full capacity according to its nameplate.

During its operation, the Donggi Matindok Field conducted an energy audit in 2021, where the audit report validated the electricity consumption of CPP Matindok, and the results were as shown in Table 3.

Table 3. Power, average power factor, and unbalanced voltage of GTG at CPP Matindok

No	Unit GTG	P (kW)	S (kVA)	Q (kVAr)	PF	Daya (kVA)	Loading (%)	Unbalance (%)
1	GTG A	1786	1908	755	0,93	5979	38	0,31
2	GTG B	1743	1884	744	0,93	5979	38	0,30
3	GTG C	1785	1936	782	0,92	5979	39	0,31

Source: Energy Audit Report, PT Pertamina EP Asset 4 Donggi Matindok Field, 2021

According to the operational pattern, the analysis was conducted on the running units, namely GTG A/B/C. From the table above, it can be seen that the voltage imbalance value of the GTG at CPP Matindok is still in good condition, which is below the maximum limit set by NEMA of 1%, while the average power factor quality is already good at 0.92, which is well

above the minimum limit set by PLN of 0.85. Based on the parameters obtained from the analysis, it is believed that the gas turbine generator equipment is still in very good condition and capable of generating electricity according to capacity if needed. This is also supported by maintenance report data indicating that there have been no damages or major repair activities on the gas turbine generator unit during its operation.

From the results of the energy audit conducted in 2021, it was validated that there is potential energy savings in the Donggi Matindok Field, one of which is sourced from the inefficiency in the power generation systems at both CPP Donggi and CPP Matindok. In line with the goal of improving efficiency in this power generation system, by the end of 2021, the Donggi Matindok field had already made improvements by changing the operational pattern of the turbine equipment used, initially running 3 units and 1 unit standby became running 2 units and 2 units standby. This improvement program is named "LOTION," which stands for Load Priority Selection. The way this program works is by reducing the main load that the power plant turbine has to bear in the event of a disturbance, and if only one unit is operating, the system will release non-critical loads, thereby ensuring that the gas processing in the CPP can continue to operate. From the efforts made, this program is able to increase the efficiency of power generation system by 20%, from initially 40% to around 60%, as shown in Fig. 4.

Energy Generation	GTG A	GTG B	GTG C	GTG D	Total
Actual conditions when operating 3 GTG without LOTION					
KW Capacity	4812	4785	4714	0	14311
KW Actual	1938	1937	1954	0	5829
KW Remaining	2874	2848	2760	0	8482
Percent Load	40.27%	40.48%	41.45%	-	40.73%
Actual conditions when operating 2 GTG without LOTION					
KW Capacity	4812	4785	0	0	9597
KW Actual	2915	2914	0	0	5829
KW Remaining	1897	1871	0	0	3768
Percent Load	60.58%	60.90%	-	-	60.74%

Figure 4. Illustration of power plant efficiency improvement through the LOTION program
 Source: Ridwan et al., 2023; 48th International Convention on Quality Control Circles (ICQCC-2023)-Beijing

Regardless of the success achieved based on best practices in the use of gas turbine generators, the gas turbine unit is capable of being operated optimally for continuous operation with an efficiency in the range of 80-90% of the nominal installed capacity. This means there is still an opportunity to improve efficiency by another 20-30% to provide maximum benefits for the company.

Determining areas for improvement

To achieve better efficiency in the operated power generation system, the author maps out areas that may be improved so that the goal of increasing efficiency can be achieved. In the FGD-1, brainstorming was conducted to identify the factors that serve as the basis for

generating alternative solutions to achieve better power plant efficiency. These factors are safety, sustainability, environment, availability & reliability equipment and commercial. On the basis of these considerations, the alternate option that has been suggested is as follows:

Alternative 1: Maximizing the use of power for the internal consumption of DMF

Alternative 2: Replacing the power generation system with a smaller capacity according to consumption needs

Alternative 3: Monetizing the excess electricity to gain additional benefits for the company

The three alternative solutions have the same goal: to improve the efficiency of the power generation system in the Donggi Matindok field. The alternative solutions are evaluated using the Kepner-Tregoe decision analysis method. Each alternative is evaluated based on predetermined criteria as shown in Table 4.

Table 4. Evaluation criteria, weight, and rating reference

MUST / WANT	Criteria	Weight	Rating Reference	
MUST	Generate higher efficiency in power generating system	-	Yes No	: Go : No Go
WANT	Cost	35%	Low (< IDR 10 billion) Medium (IDR 10 to 50 billion) High (> IDR 50 billion)	100 50 25
	Complexity	30%	Simple - independent Simple - interdependent Complex - independent Complex - interdependent	100 75 50 25
	Duration of service live	20%	More than 10 years Between 5 to 10 years Less than 5 years	100 50 25
	Ease of operation and maintenance	10%	Easier than the existing Same as the existing More difficult than the existing	100 50 25
	Time	5%	Less than 2 years Between 2 to 5 years More than 5 years	100 50 25

Source: Kepner-Tregoe analysis based on FGD-1 with subject matter experts, 2026

Each alternative solution is evaluated by scoring each predetermined criterion based on the weight and assessment for each criterion. Table 5 shows the results of the alternative solution analysis based on the predetermined evaluation criteria, leading to the identification of appropriate improvement areas to address the main issue.

Table 5 Evaluation result of determining improvement area

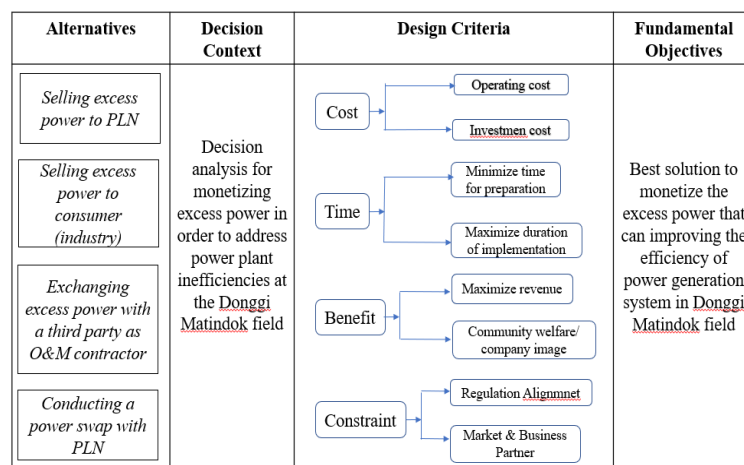
M U S T	Criteria		Alternative 1			Alternative 2			Alternative 3		
	Generate higher efficiency in power generating system		Go			Go			Go		
W A N T	Criteria	Weight	Alternative 1			Alternative 2			Alternative 3		
			Evaluation	Rating	Score	Evaluation	Rating	Score	Evaluation	Rating	Score
	Cost	35%	20 bio	50	17.5	200 bio	25	8.75	9 bio	100	35
	Complexity	30%	Simple-Interdependent	75	22.5	Complex-Independent	50	15	Simple-independent	100	30
	Duration of service live	20%	10 years (end of PSC)	50	10	10 years (end of PSC)	50	10	10 years (end of PSC)	50	10
	Ease of operation and maintenance	10%	Same as the existing	50	5	Easier than the existing	100	10	More difficult than the existing	25	2.5
	Time	5%	Between 2 to 5 years	50	2.5	Between 2 to 5 years	50	2.5	Less than 2 years	100	5
Total Score			57.5			46.25			82.5		

Source: Kepner-Tregoe decision analysis based on FGD-1 result, 2026

Based on the evaluation, it was found that alternative 3 is the most appropriate step to improve the efficiency of the power generation system at the Donggi Matindok field, which involves monetizing the excess electricity available, where this alternative received the highest score of 82.5 compared to the other two alternatives.

A group discussion based on the value focused thinking conduct to explore insights from subject matter experts in determining several business solutions to monetize the excess power, relevant alternatives have emerged from the focus group discussion process among subject matter experts to achieve the basic objectives while considering the specified attributes. Table 6 shows the Value-Focused Thinking (VFT) process to address the inefficiency issues of the power plant in the Donggi Matindok field.

Table 6 VFT process for inefficiency of DMF's power plant



Source: Value-Focused Thinking analysis based on FGD-2 with subject matter experts, 2026

Business Solution

Selecting the optimal strategy scheme as the selected alternative to improve the efficiency of the power plant in the Donggi Matindok Field needs to be done using the Analytical Hierarchy Process (AHP) which must consider several criteria and sub-criteria as shown in table 7.

Table 7. Description of each criteria / sub-criteria

Criteria / sub-criteria	Description
➤ Cost	Total cost of implementing the alternatives
○ Operating cost	The costs incurred for maintenance work on the power plant are averaged over one year during the operational cycle include fuel cost
○ Investment cost	The costs incurred to prepare the new facilities required to implement the alternative, including material purchase costs, fabrication/installation costs, and commissioning costs.
➤ Time	The time required for preparation and how long the alternative will run
○ Minimize time for preparation	Accelerate the start time of alternative implementation
○ Maximize duration of implementation	The longer the alternative time is implemented, the greater the benefits obtained.
➤ Benefit	The advantage that can be obtained
○ Maximize revenue	Obtain potential revenue gain from selling the excess power
○ Increasing community welfare / company image	Engagement with the community can enhance the smoothness of operational activities.
➤ Constraint	Obstacles faced in realizing alternatives
○ Regulation alignment	Alternative aligned with applicable provisions or regulations
○ Market & business partners	Availability and acceptance by consumers and business partners in the sale of excess power

Source: Value-Focused Thinking analysis based on FGD-2 with subject matter experts (2026)

The Research Design Flow is used to establish a hierarchical tree that delineates the relationship between alternatives and criteria, as well as sub-criteria, with the objective of determining the decision. This is explicated in the AHP Hierarchy structure as shown in Fig. 5.

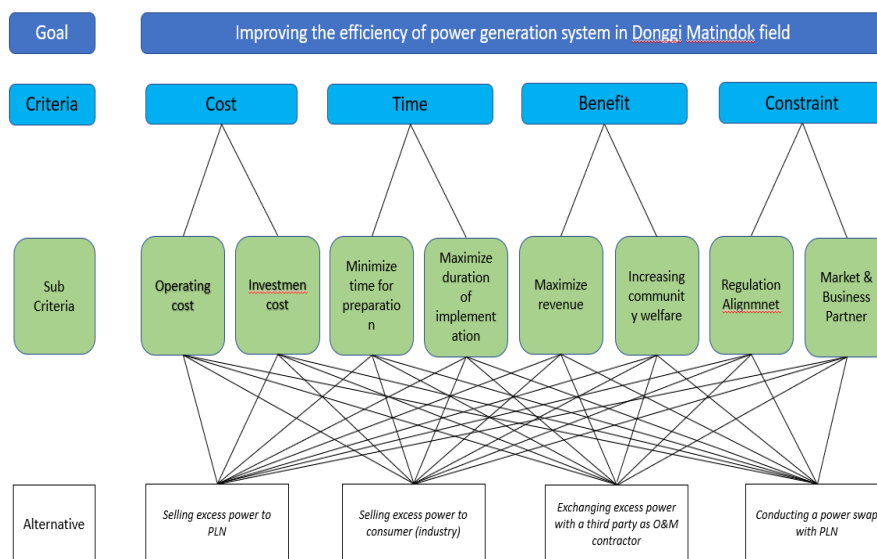


Figure 5. AHP hierarchy structure

Source: Developed by the author based on AHP methodology and FGD-2 results (2026)

Pairwise comparisons were presented in the form of questionnaires collected from several Subject Matter Experts (SMEs) closely related to the design, operation and maintenance, safety, economics, and management of power generation systems. The correspondents will offer their perspectives on the prospective criteria and sub-criteria that encompass the most effective alternatives. Data from SMEs is aggregated via the geometric mean. The Expert Pairwise Comparisons Geometric Mean is presented in Fig. 6.

Parameter		Geomean Point	Parameter	Geomean Point
Criteria	Cost	8.277	Time	0.121
	Cost	2.080	Benefit	0.481
	Cost	0.442	Constraint	2.265
	Time	0.179	Benefit	5.593
	Time	0.169	Constraint	5.916
	Benefit	0.306	Constraint	3.267
Criteria	Sub-criteria	Geomean Point	Sub-criteria	Geomean Point
Cost	Operating cost	4.857	Investment Cost	0.206
Sub-criteria	Alternative	Geomean Point	Alternative	Geomean Point
Operating cost	Alternative 1	1.442	Alternative 2	0.693
	Alternative 1	3.267	Alternative 3	0.306
	Alternative 1	0.281	Alternative 4	3.557
	Alternative 2	3.267	Alternative 3	0.306
	Alternative 2	0.281	Alternative 4	3.557
	Alternative 3	0.189	Alternative 4	5.288
Investment Cost	Alternative 1	7.612	Alternative 2	0.131
	Alternative 1	2.720	Alternative 3	0.368
	Alternative 1	3.762	Alternative 4	0.266
	Alternative 2	0.212	Alternative 3	4.718
	Alternative 2	0.319	Alternative 4	3.133
	Alternative 3	3.000	Alternative 4	0.333
Criteria	Sub-criteria	Geomean Point	Sub-criteria	Geomean Point
Time	Preparation time	0.147	Duration of Implementation	6.804
Sub-criteria	Alternative	Geomean Point	Alternative	Geomean Point
Preparation time	Alternative 1	6.901	Alternative 2	0.145
	Alternative 1	1.000	Alternative 3	1.000
	Alternative 1	3.267	Alternative 4	0.306
	Alternative 2	0.174	Alternative 3	5.747
	Alternative 2	0.258	Alternative 4	3.873
	Alternative 3	2.720	Alternative 4	0.368
Duration of Implementation	Alternative 1	0.145	Alternative 2	6.892
	Alternative 1	1.000	Alternative 3	1.000
	Alternative 1	0.200	Alternative 4	4.990
	Alternative 2	3.873	Alternative 3	0.258
	Alternative 2	1.000	Alternative 4	1.000
	Alternative 3	0.218	Alternative 4	4.592
Criteria	Sub-criteria	Geomean Point	Sub-criteria	Geomean Point
Benefit	Maximize Revenue	2.265	Community welfare	0.442
Sub-criteria	Alternative	Geomean Point	Alternative	Geomean Point
Maximize Revenue	Alternative 1	0.151	Alternative 2	6.618
	Alternative 1	2.080	Alternative 3	0.481
	Alternative 1	0.224	Alternative 4	4.460
	Alternative 2	7.612	Alternative 3	0.131
	Alternative 2	3.000	Alternative 4	0.333
	Alternative 3	0.169	Alternative 4	5.916
Community welfare	Alternative 1	4.919	Alternative 2	0.203
	Alternative 1	1.000	Alternative 3	1.000
	Alternative 1	1.000	Alternative 4	1.000
	Alternative 2	0.212	Alternative 3	4.718
	Alternative 2	0.195	Alternative 4	5.137
	Alternative 3	0.577	Alternative 4	1.732
Criteria	Sub-criteria	Geomean Point	Sub-criteria	Geomean Point
Constraint	Regulation Compliant	2.962	Market & business partner	0.338
Sub-criteria	Alternative	Geomean Point	Alternative	Geomean Point
Regulation Compliant	Alternative 1	2.720	Alternative 2	0.368
	Alternative 1	0.400	Alternative 3	2.498
	Alternative 1	0.281	Alternative 4	3.557
	Alternative 2	0.218	Alternative 3	4.592
	Alternative 2	0.195	Alternative 4	5.137
	Alternative 3	0.310	Alternative 4	3.225
Market & business partner	Alternative 1	7.197	Alternative 2	0.139
	Alternative 1	1.732	Alternative 3	0.577
	Alternative 1	0.400	Alternative 4	2.498
	Alternative 2	0.258	Alternative 3	3.873
	Alternative 2	0.147	Alternative 4	6.804
	Alternative 3	0.306	Alternative 4	3.267

Figure 6. AHP Expert Pairwise Comparison Geometric Mean

Source: Primary data from AHP questionnaires administered to subject matter experts (2026)

The next AHP step processes data from comparison to weigh by creating a matrix of comparisons and representing it as an Eigen Vector and Checking Consistency Ratio (CR). The results of the CI and CR calculations are shown in Table 7. The consistency ratio assessment for all criteria and sub-criteria indicates consistent and acceptable results, as the CR is less than or equal to 0.1.

Table 7. Description of each criteria / sub-criteria

CRITERIA	CI	CR	SUB-CRITERIA	CI	CR
Cost	0.0618	0.0687	Operating cost	0.0319	0.0355
			Investment Cost	0.0326	0.0363
Time			Prepartion time	0.0170	0.0189
			Duration of Implementation	0.0099	0.0110
Benefit			Maximize Revenue	0.0375	0.0417
			Community welfare	0.0109	0.0121
Constraint			Regulation Compliant	0.0498	0.0553
			Market & business partner	0.0301	0.0334

Source: Value-Focused Thinking analysis based on FGD-2 with subject matter experts (2026)

Based on the calculation results as shown in Table 8, it is concluded that the main criterion that must be considered to monetize excess power in order to improve the efficiency of power plant in the Donggi Matindok Field is the constraint factor with a priority weight of 0.4732. This is followed by other criteria. Based on the four evaluated alternatives, it is known that the best option is the fourth alternative, namely Conducting a power swap with PLN as the first-choice alternative with a priority weight of 0.46124.

Table 8. Weighted for Criteria, Sub criteria, and Alternatives

CRITERIA	SUB-CRITERIA		ALTERNATIVES											
			I		II		III		IV					
Weight	CR	Weight	Normalized	CR	Weight	Normalized	Weight	Normalized	Weight	Normalized	Weight	Normalized		
Cost	0.3015	Operating cost	0.8293	0.2500	0.04	0.2060	0.0515	0.1747	0.0437	0.0724	0.0181	0.5469	0.1367	
			Investment Cost	0.1707	0.0515	0.04	0.5331	0.0274	0.0561	0.0029	0.2751	0.0142	0.1357	0.0070
Time	0.0487	Prepartion time	0.1281	0.0062	0.02	0.4116	0.0026	0.0551	0.0003	0.3762	0.0023	0.1572	0.0010	
			Duration of Implementation	0.8719	0.0425	0.01	0.0777	0.0033	0.4240	0.0180	0.0913	0.0039	0.4070	0.0173
Benefit	0.1766	Maximize Revenue	0.6937	0.1225	0.04	0.0874	0.0107	0.5718	0.0700	0.0546	0.0067	0.2863	0.0351	
			Community welfare	0.3063	0.0541	0.01	0.3096	0.0167	0.0627	0.0034	0.2683	0.0145	0.3594	0.0194
Constraint	0.4732	Regulation Compliant	0.7476	0.3537	0.06	0.1443	0.0510	0.0695	0.0246	0.2645	0.0936	0.5217	0.1846	
			Market & business partner	0.2524	0.1194	0.03	0.2778	0.0332	0.0516	0.0062	0.1668	0.0199	0.5037	0.0602
Priority Weight							0.19648	0.16910		0.17318		0.46124		

Source: AHP analysis results based on expert pairwise comparisons (2026)

To ensure the selected option aligns with the company's expectations, an interview with the Senior Manager was conducted in an unstructured format, without systematic and comprehensive rules. As the interview results it was concluded that this option aligns with the company's needs. If the power swap strategy is implemented, it can alleviate the operational cost burden in the less economical fields without increasing the operational costs in the fields that donate their excess power.

CONCLUSION

Based on the analysis results, the best alternative for managing the power plant at the Donggi Matindok Field is to implement a power swap scheme in collaboration with PLN, which also aligns with the research objective. The Kepner-Tregoe Decision Analysis approach was applied to evaluate three potential improvement areas for enhancing power plant efficiency identified through discussion and brainstorming. The analysis indicated that monetizing excess electricity was the most appropriate measure to optimize the power generation system, achieving the highest score of 82.5. Furthermore, SWOT and PESTEL aspects were analyzed and integrated using a Value-Focused Thinking approach to identify evaluation criteria, sub-criteria, and alternative solutions. Expert judgment through pairwise comparisons, conducted using the Analytical Hierarchy Process (AHP) method, was then employed to assign weights to each criterion and sub-criterion. The final result of this research shows that implementing a power exchange with PLN—intended to utilize excess power in other operational areas managed by PT Pertamina EP—is the most effective solution for improving power plant efficiency at the Donggi Matindok Field.

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