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Building a Green Energy Future: Strategic Business Unit Planning for Hydrogen and Biomethane in Pipeline Operations

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Abstract

PT Gas Pipeline Transportation (PT GPT) is a crucial part of Indonesia's energy infrastructure, particularly in natural gas transportation through pipelines. To ensure the contract with Singapore after 2028, PT GPT must develop a business development strategy to efficiently carry out operational activities. This study aims to identify opportunities and challenges in developing the Strategic Business Unit Green Energy (Hydrogen and Biomethane) PT. GPT, focusing on the green energy market. The EFAS Score of 3.8 indicates that PT GPT can handle external factors and has good internal strengths in managing and developing the business unit. High internal capabilities, such as existing technology, infrastructure, and human resource capabilities, enable PT GPT to develop its green energy SBU more effectively. The Space Matrix suggests an aggressive strategy to develop hydrogen and biomethane green energy by utilizing existing opportunities. PT GPT is in the Question Marks category, with a relative market share of 10% for hydrogen and 5% for biomethane. The Strategy Formulation Results show a comprehensive approach, focusing on internal strengths and external opportunities. The Marketing and Education strategy can drive product adoption, while the ST strategy focuses on reducing costs and increasing product competitiveness. The Technology Innovation Strategy emphasizes investment in research and development to create more efficient and environmentally friendly solutions. The Sustainability Strategy ensures operational sustainability to comply with regulations and support long-term sustainability.

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Keywords: strategic business unit (SBU), green energy (Hydrogen and Biomethane), clean energy

Introduction

SBU Green Energy and PT. GPT are key players in Indonesia's energy infrastructure, particularly in natural gas transportation through pipelines. They are investing in technology and efficiency to reduce dependence on non-renewable energy and climate change impacts. PT. GPT is expanding its gas pipeline network to connect gas sources with industrial users and end consumers, using digitalization technologies like IoT and Big Data to monitor pipeline integrity and improve operational safety. It supports the clean energy transition in Indonesia by improving gas transportation efficiency and ensuring stable supply to consumers. PT. GPT is significant in the energy and industry sectors, supporting national energy security and encouraging growth in strategic sectors like industry, power generation, and transportation. However, challenges and business opportunities need to be developed to anticipate the contract with Singapore after 2028, as Singapore may not extend the contract due to product substitution, government policies, or gas production running out.

The development of hydrogen and biomethane energy is not free from various challenges, such as high investment costs, lack of related technology and knowledge, and tight competition with other large energy PT. GPT.

Therefore, comprehensive planning is needed, including market studies, technology, regulations, and appropriate business models to ensure the success of the development of this new business unit.

This article aims to Identify opportunities and challenges in developing Strategic Business Unit Green Energy (Hydrogen and Biomethane), Develop an effective strategic plan to enter the green energy market, by utilizing the advantages of existing infrastructure and assessing the internal readiness of PT. GPT and evaluating the most appropriate business model and investment scenario to develop hydrogen and biomethane business units, to ensure the sustainability and competitiveness of PT. GPT in facing changes in the dynamics of the energy industry in Indonesia and the world.

With proper planning, the development of hydrogen and biomethane business units at PT. GPT is expected to be an important pillar in driving the growth of PT. GPT, while supporting the national energy transition towards cleaner, more efficient, and more sustainable energy use.

Method

Types and Methods of Research

This study uses primary data from respondents or research locations, using a descriptive analytical method with a qualitative approach. The data is collected through observation or field research, with interviews and research resource persons providing direct information to answer research problems objectively. The study will analyze the model formulation through SWOT analysis using six people, chosen based on their importance to the problems, knowledge and experience in business development, government regulations, and customers. The data will be processed using SWOT analysis.

Operational Definition of Research Variables

The research focuses on PT. GPT's internal and external

factors, including human resource quality, infrastructure conditions, and management. It also examines external factors, such as opportunities and threats, using SWOT analysis. Understanding these factors helps identify strengths and weaknesses from an internal perspective, as well as opportunities and threats from an external perspective. The research aims to understand the impact of these variables on PT. GPT's business development.

Business development strategy

Strategy is a tool to achieve long-term goals in PT. GPT by utilizing and allocating all available resources (Chandler in Rangkuti, 2014:4). The gas transportation business development strategy is everything that is done to achieve business development goals. Data Analysis Techniques Basically, data analysis is a process of simplifying data to make it easier to read and interpret. The existing data will be analyzed into a simpler form to then seek broader meaning and implications from the research results (Wardiyanta in Samaji), The analysis method used in this study is SWOT analysis used for the analysis of PT. GPT's business development strategy.

SWOT Analysis

The analysis of Strengths and Weaknesses of the internal environment and Opportunities and Threats (SWOT) in this study is used to determine the development strategy method by analyzing external factors in the form of opportunities and threats and internal factors in the form of strengths and weaknesses.

Results and Discussion

IFAS and EFAS calculation results

Table 1. IFAS

No	Internal Factors	Weight	Rating	Score (Weight x Rating)	Information
	Strength				
1	Existing gas transportation infrastructure	0.2	4	0.8	Existing infrastructure supports hydrogen/Biomethane distribution.
2	Experience and technical capabilities in the energy sector	0.2	4	0.8	PT. GPT's experience in the energy industry facilitates the development of green energy.
3	Good relations with government and regulators	0.15	5	0.75	This relationship is very important to support the development of the Green Energy SBU.
4	PT. GPT's reputation in the energy industry in Indonesia	0.1	4	0.4	A good reputation gives confidence to investors and other stakeholders.
5	Human resource expertise in renewable energy	0.1	3	0.3	Skilled human resources are important to support development.
	Weakness				
6	Research and development limitations for green energy	0.15	2	0.3	Limited R&D can hinder technological innovation.
7	Limited funding or access to investment	0.1	2	0.2	Limited funding can hinder technology expansion and development.
8	Slow adaptation to market changes	0.1	3	0.3	PT. GPT must adapt faster to remain competitive in the market.
9	Lack of strategic partnerships in the renewable energy sector	0.05	3	0.15	Stronger partnerships can accelerate technology development.
10	Limitations in rapid change management and flexibility	0.05	2	0.1	Organizations need to be more flexible in responding to changing market needs.
Total Score				3.9	

Table 2: EFAS

No	External Factors	Weight	Rating	Score(Weight x Rating)	Information
Opportunity					
1	Global market potential for hydrogen and biomethane	0.15	4	0.6	The renewable energy market, especially hydrogen and Biomethane, is growing rapidly.
2	Government policies that support the clean energy transition	0.2	5	1	Regulations that support green energy open up huge opportunities.
3	New technologies in hydrogen/Biomethane storage and distribution	0.1	4	0.4	Technological innovation supports cost reduction and efficiency.
4	Growing public awareness of renewable energy	0.15	4	0.6	Awareness of sustainability is increasing the demand for green energy.
5	Partnership opportunities with PT. GPT global/local in the green energy sector	0.1	3	0.3	Partnerships can accelerate technology adoption and strengthen market position.
Threat					
1	Uncertainty of energy regulations and government policies	0.15	2	0.3	Changing regulations can affect market stability.
2	Competition with other renewable energy sectors (solar, wind)	0.1	3	0.3	Competition from other renewables could reduce market share.
3	Fossil fuel price fluctuations affect the competitiveness of green energy	0.05	2	0.1	Unstable fossil fuel prices could impact the competitiveness of hydrogen.
4	Technical challenges in hydrogen/Biomethane storage and distribution	0.1	3	0.3	Technical problems in storage and transportation can be a barrier.
5	High initial investment costs and required infrastructure	0.1	2	0.2	Large initial investments can be a barrier to development.
Total Score				3.8	

Porter's Five Forces

Threat of New Entrants

1. **High initial investment costs:** Entering the green energy sector requires huge investment, especially for new technology infrastructure such as hydrogen and bioenergy.
2. **Government regulatory support:** The Indonesian government provides many incentives and regulations that support the development of green energy.
3. **Economies of scale:** PT Gas Pipeline Transportation has a scale advantage because of its existing infrastructure, such as a natural gas distribution network that can be adapted for green energy transportation.

Bargaining Power of Suppliers

1. **Dependence on green energy technology suppliers:** Suppliers of green energy technologies such as hydrogen producers or bioenergy technology providers have high negotiating power, especially if there are only a few suppliers that can provide a specific technology or component.
2. **Availability of natural resources:** Resources for green energy such as hydrogen or biomass can be limited and controlled by a few suppliers. This increases the power of suppliers in determining prices and terms of supply.
3. **Existing gas infrastructure:** Green Energy technology suppliers may not have much bargaining power in the energy distribution aspect, because PT. Gas Pipeline Transportation already has an established infrastructure.

Bargaining Power of Buyers

1. **Alternative energy options:** Energy buyers, especially large GPTs or governments, have many choices of renewable energy sources such as solar, wind, or hydro, in addition to hydrogen and bioenergy. This gives them the power to bid lower prices.
2. **Price sensitivity:** Because green energy technology is new and more expensive than conventional energy,

buyers will be very price sensitive.

3. **Demand for clean energy:** However, with increasing environmental awareness and ESG (Environment, Social, Governance) targets that PT. GPT must meet, buyer power may decrease as they need to switch to clean energy sources.

Threat of Substitute Products or Services

1. **Other renewable energy:** Other renewables such as solar, wind, and geothermal are the main substitute products for hydrogen or bioenergy. These technologies are more established and can be an option for consumers who want to switch to green energy.
2. **Fossil energy is still dominant:** Natural gas, which is still considered cheaper and has more established supporting infrastructure, is also still the main substitute in the short term.
3. **Technological advantages:** Hydrogen and bioenergy have advantages in some applications, such as heavy transportation or large industries that cannot be supported by solar or wind energy, but technological advances in other sectors may create more efficient substitutes.

Intensity of Industry Rivalry

1. **Big players in the green energy sector:** In Indonesia, big players such as Pertamina, PLN, and other renewable energy companies PT. GPT have started investing in green energy. They have large resources and strong relationships with the government, which increases the level of competition.
2. **Innovation and technology development:** Competitive advantage in the Green Energy sector is often determined by the ability to innovate technology. PT Gas Pipeline Transportation needs to compete with other PT. GPTs that invest more in R&D to create more efficient green energy products.
3. **Low switching costs:** Buyers can easily switch from one

green energy provider to another, especially if the price and efficiency are more competitive. This increases the level of competition.

4. **Market growth:** Although the Green Energy market is

growing rapidly, the increasing number of players entering the market can tighten competition, reducing the profit margin of PT. GPT which does not innovate.

Space Matrix

Internal Strengths and Weaknesses Assessment for Hydrogen and Biomethane Green Energy

Table 3: Internal Space Matrix Table

Internal Factors	Points (Scale -6 to +6)	Reason/Justification
Strength		
Extensive gas infrastructure	5	Has a strong natural gas distribution infrastructure in Indonesia, including main pipelines.
Experience in the energy sector	4	Extensive experience in natural gas distribution in Indonesia provides a good basis for expansion into the renewable energy sector.
Weakness		
Doesn't have a big market share yet	-4	In the hydrogen and biomethane sectors, PT. GPT still has a relatively small market share compared to major players in both sectors.
Dependence on natural gas	-3	Dependence on natural gas, which is a fossil fuel source, can be an obstacle to the development of the green energy sector (hydrogen, biomethane).

External Opportunities and Threats Assessment for Hydrogen and Biomethane Green Energy

Table 4: External Space Matrix Table

External Factors	Points (Scale -6 to +6)	Reason/Justification
Opportunity		
Government support for renewable energy	5	The Indonesian government supports the development of renewable energy, including hydrogen and biomethane, through policies and incentives.
Global hydrogen market growth	4	The global hydrogen energy market is expected to grow rapidly along with the need for clean energy and reducing carbon emissions.
Availability of biomethane raw materials	3	Indonesia has a lot of organic waste, especially from the agricultural sector, which can be used to produce biomethane.
Threat		
Tight competition with big players	-5	Big players like PLN and PT. GPT other energies are already established in the biomethane and hydrogen sectors, which makes the competition even tighter.
The uncertainty of hydrogen technology	-3	Hydrogen technology is still in the development stage and has not been commercially proven, so it can be a risk in investment.

Calculating Final Values for Space Matrix

Calculating the Vertical Axis (Internal Strengths vs. Weaknesses):

1. Strength: $(5 + 4) / 2 = +4.5$
2. Weakness: $(-4 - 3) / 2 = -3.5$
3. **Vertical Axis** $4.5 \text{ (Strength)} - 3.5 \text{ (Weakness)} = +1.0$

Counting Horizontal Axis (Opportunities vs External Threats)

1. Odds: $(5 + 4 + 3) / 3 = +4.0$
2. Threat: $(-5 - 3) / 2 = -4.0$

3. **Horizontal Axis** $= 4.0 \text{ (Opportunity)} - 4.0 \text{ (Threat)} = 0.0$

Position in Space Matrix

With the Vertical Axis value = +1.0 and the Horizontal Axis = 0.0, the position of PT Gas Pipeline Transportation will be in the "Aggressive Strategy" quadrant, which indicates that it has quite strong internal strengths (positive value on strength) but also faces significant external threats (negative value on threats), which requires them to take proactive steps in facing competition.

BCG Matrix

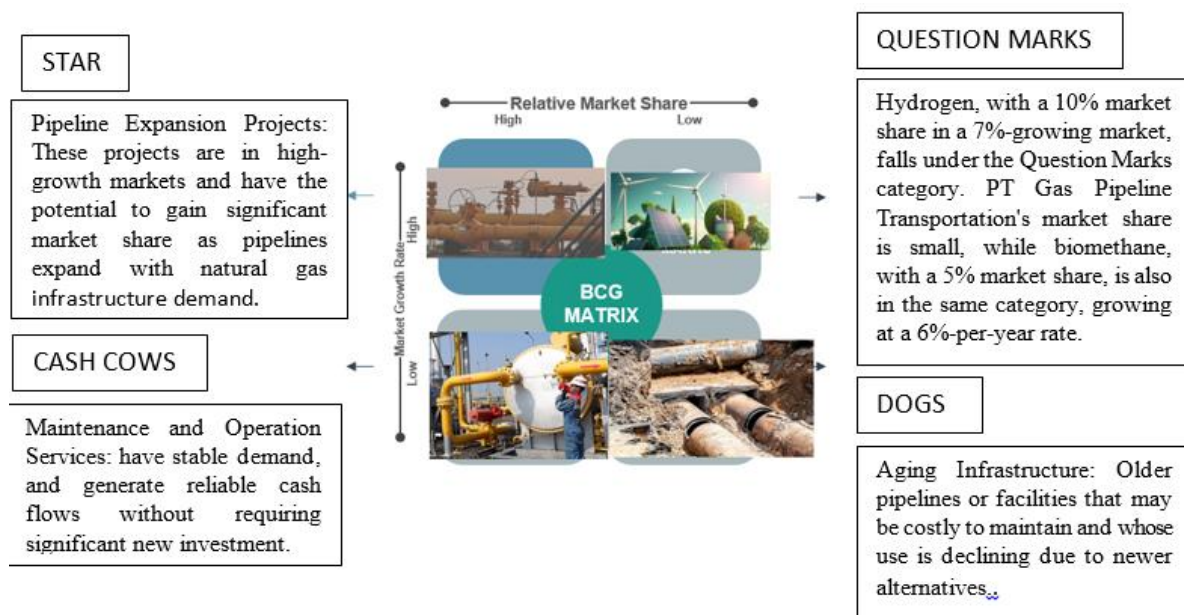


Fig 1: BCG Matrix Image

Relative Market Share Calculation

To provide a clearer picture of the market size and estimated needs, we will calculate the potential market share that can be achieved by PT. Gas Pipeline Transportation based on annual needs.

Hydrogen

1. Hydrogen requirement: 9.9 million tons per year.
2. Suppose the global hydrogen market is estimated to reach 100 million tons per year (a rough estimate for illustration).

The Relative Market Share of PT. Gas Pipeline Transportation is 10%, so:

1. Market Share of PT. Gas Pipeline Transportation in the Hydrogen market = 10% of 100 million tons = 10 million tons per year.
2. With 9.9 million tons per year of hydrogen needs of PT. Gas Pipeline Transportation, the market share that can be

achieved is almost close to the relative market share owned by PT. GPT.

Biomethane

1. Biomethane requirement: 26.72 million tons per year.
2. Suppose the global Biomethane market is estimated to reach 500 million tons per year (rough estimate for illustration).

The Relative Market Share of PT. Gas Pipeline Transportation is 5%, so:

1. PT. Gas Pipeline Transportation's Market Share in the Biomethane market = 5% of 500 million tons = 25 million tons per year.
2. With 26.72 million tons per year of Biomethane needs of PT. Gas Pipeline Transportation, the market share achieved by PT. GPT also almost reaches the figure calculated based on relative market share.

Strategy Formulation

Table 5: SWOT Strategy Formulation Table

IFAS / EFAS	Strengths (S) Internal strength factors	Weakness (W) Internal strength factors
Opportunities (O) External opportunity factors	SO Strategy Marketing and Education: Conduct marketing campaigns to increase consumer awareness of the benefits of hydrogen and biomethane as clean energy sources.	WO Strategy Technological Innovation: Investment in R&D to develop more efficient and environmentally friendly production processes for biomethane and hydrogen.
Treats (T) External threat factors	ST Strategy Operational Efficiency Improvement: Optimizing production processes to increase efficiency and reduce costs, so that they can compete with alternative products.	WT Strategy Sustainability Strategy: Develop sustainable policies and procedures to ensure that all green energy operations comply with environmental regulations and standards.

Conclusion

Based on the research results and analysis, it can be concluded that:

1. EFAS score 3.8, this shows that PT. GPT is able to face existing external factors, such as market opportunities or

changes in renewable energy policies, very well. This value indicates that PT. GPT has great potential to take advantage of opportunities in the green energy sector (hydrogen and biomethane), and the external environment provides favorable conditions. With this

- score, PT. GPT is likely to be in a good position to take advantage of opportunities in the green energy market, such as increasing demand for clean energy and government policies that support the development of renewable energy.
2. IFAS score (3.9), shows that PT. GPT has very good internal strength in managing and developing this business unit. High internal capabilities, such as existing technology, supporting infrastructure, or human resource capabilities, allow PT. GPT to develop green energy SBU more effectively. This score also indicates that PT. GPT has competitive advantages within the organization that can be utilized to develop green energy, such as hydrogen and biomethane.
 3. From the Space Matrix Results, PT. GPT must adopt an aggressive strategy to develop green energy Hydrogen and Biomethane By utilizing existing opportunities. PT. GPT must be able to strengthen its position in the renewable energy market.
 4. Based on BCG Results, PT. GPT is in the Question Marks category because the relative market share is 10% for hydrogen and 5% biomethane.
 5. Based on the Strategy Formulation Results by analyzing SO, ST, WO, and WT, the strategy created for PT. GPT shows a comprehensive approach and focuses on utilizing internal strengths and external opportunities. PT. GPT can inform consumers about the benefits of hydrogen and Biomethane through the SO (Marketing and Education) strategy, which can encourage product adoption. The ST (Improving Operational Efficiency) strategy focuses on reducing costs and increasing product competitiveness in a competitive market. The Technology Innovation (WO) strategy emphasizes that investment in research and development is essential to create more efficient and environmentally friendly solutions. Meanwhile, the Sustainability Strategy (WT) focuses on ensuring operational sustainability, which is essential to comply with regulations and support long-term sustainability.
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