Quo vadis steam power plant in Indonesia? Implementation of GE-McKinsey matrix analysis on creating the strategy for steam power plant business entity

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Abstract. Although today Indonesia develops renewable energy actively, the energy mix for Steam Power Plant is still dominant at 27% based on RUPTL 2019-2028. Lots of entities are involved in business related to a steam power plant in Indonesia, ranging from mining companies, coal transport companies, and steam power plants owned by PLN, PLN’s subsidiaries, and IPP. This paper aims to conduct an internal and external analysis of the condition of the steam power plant industry and market in Indonesia and to determine the strategies and policies for the management of entities involved in business related to Steam Power Plant. Internal and external analysis is performed using PESTEL Analysis, Porter Analysis and Resource Based Analysis. Then, an analysis is conducted to evaluate the current condition of the portfolio using the GE McKinsey Matrix Analysis to assess the business strength and industry attractiveness of each entity. Based on those analyses, IPP Coastal Steam Power Plant should not only develop Medium Rank Coal-based power plants, but also HRLS (High-Risk Low Sulphur) coal, which is still large in reserves and coal prices tend to fall and has the potential to be sold on the domestic market rather than being sold to the import market (which tends to start leaving behind fossil plants and increasing the share of renewable energy). IPP Mine Mouth Power Plant should start to use Medium Rank Coal (not only Very Low-Rank Coal), considering that there is still a lot of Medium Rank Low Sulphur (MRLS) and Medium Rank High Sulphur (MRHS) coal. As a coal concession owner, not only looking for low-rank coal to be acquired but also looking for medium coal rank (MRLS or MRHS) concessions, especially in Sumatra, which at present valuation will be at a low value.

1. Introduction

Bloomberg predicts that wind and solar power plants will make up almost 50% of world electricity in 2050 – "50 by 50" (Figure 1) and help put the power sector on track for 2 degrees to at least 2030 [1]. A 12TW expansion of generating capacity requires about $13.3 trillion of new investment between now and 2050 – 77% of which goes to renewables [2]. Also, the Government of Indonesia, through the National Energy General Plan, has targeted a mix of renewable energy reaching 23% by 2025. Many entities are involved in business related to the steam power plant in Indonesia, ranging from mining companies, coal transport companies, and steam power plants owned by PLN, PLN’s subsidiaries, and IPP (Figure 2). A large portion of conventional power plants, particularly steam power plants, had been installed in Indonesia, as stipulated in Figure 3.
Refer to the condition above, coal entity business in electricity is required to improve the portfolio management, mainly coal-related business, to deal with the changes in the future of energy mix.

Based on the explanation above, a strategic portfolio analysis that considers the internal and external conditions of the coal and electricity industry is required to optimize the portfolio of coal entity business in electricity.

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**Figure 1.** Energy Outlook 1970-2050. Source: Bloomberg BNEF.

**Figure 2.** Installed Capacity Existing Steam Power Plant in Indonesia [3].

**Figure 3.** GE-McKinsey Matrix
2. Method

2.1 PESTEL Analysis
PESTEL model is: "A framework that categorizes and analyzes an important set of external forces (political, economic, sociocultural, technological, ecological and legal) that might impinge upon a firm. These forces are embedded in the global environment and can create both opportunities and threats for the firm" [4].

2.2 PORTER Analysis
According to Rothaermel: "Michael Porter developed the highly influential five forces model to help managers understand the profit potential of different industries and how they can position their respective firms to gain and sustain advantage. By combining theory from industrial organizations economics with hundreds of detailed case studies, Porter derived two key insights that form the basis of his seminal five forces model" [4].

a. Rather than defining competition narrowly as the firm's closest competitors to explain and predict a firm's performance, the competition must be viewed more broadly to encompass not only direct rivals but also a set of other forces in an industry: buyers, suppliers, the potential new entry of other firms and the threat of substitutes.

b. The profit potential of an industry is neither random nor entirely determined by industry-specific factors. Instead, it is a function of the five forces that shape competition: the threat of entry, suppliers' power, buyers' power, the threat of substitutes, and rivalry among existing firms.

2.3 GE-McKinsey Matrix
The GE model is a nine-cell portfolio matrix based on two dimensions: long-term product/market attractiveness and business strength/competitiveness. In this matrix, industry size is represented by a circle. The pie that slices within the circle reflects the business's market share [5].

 Strategic Business Unit (SBU) is plotted against two dimensions industry attractiveness on the vertical axis and competitive position on the horizontal axis.

2.4 Framework of Thinking
Based on the background, problems, and study of the concepts above, the thinking framework is arranged as shown in the Figure 4 below.

![Figure 4. Framework of Thinking.](image)

3. Results and Discussions

3.1 Pestel Analysis
3.1.1 Political
According to World Economic Forum: "This year's report grapples with some of the most pressing challenges that we face, including biodiversity loss, cybersecurity threats, rising geopolitical tensions, and the risk of another financial crisis erupting [6]".
Most of Indonesia's domestic coal production, around 80%, is being exported to several countries, mainly to China and India. Meanwhile, China’s coal demand is projected to decline due to industry growth and campaign from the government to replace coal with natural gas or renewable in power generation, as happened in India, and implemented several policies to reduce imports.

Not only the geopolitical tension, in recent decades, increasing energy prices, demand of electricity, and the implementation of government subsidies for the installation of distributed Variation Renewable Energy (VRE), in example large scale solar PV and Wind, and rooftop solar PV, has led to a dramatic rise in installed capacity of VRE in Europe (especially Germany and Australia). Those events will affect the development of the country in Southeast Asia like Indonesia to produce and consume VRE, instead of using fossil fuels. Nowadays, the Indonesian government initiative to include renewable energy in the energy mix.

3.1.2 Economic
According to the World Bank: "Global economic growth will be stagnant from 2018-2020 at 2.9-3.1%" [7]. There is a massive substitution effect between renewable energy and fossil fuels like coal, oil, and gas etc., then renewable energy, consumers are likely to choose renewables. As an example, the gasoline price is the most accessible indicator to measure the price of fossil fuels. In several cases, the higher the gasoline price, the greater the chance that renewable energy will replace fossil fuels. Europe and Japan, which have cleaner and more efficient energy systems, are good examples.

3.1.3 Technology
Technology is growing very rapidly, especially information technology. These developments significantly affect utility companies, especially in terms of efficiency.

3.1.4 Environmental & Legal
Climate change is an environmental issue that is always associated with the use of fossil fuels (oil, coal, and gas). The rise in the economy will be followed by the increasing use of fossil fuels, especially fuels that will contribute to increased greenhouse gases. This would lead to extreme climate changes that occur on earth.

3.2 PORTER Analysis
The PORTER’s analysis of the coal business industry is shown by Figure 5 below. Based on the Porter Analysis, the coal industry in Indonesia is an industry that is not attractive to new investors to invest.

![Figure 5. PORTER Analysis of Coal Industry.](image)

3.3 GE McKinsey Matrix
Typical coal for coal classification related to the electricity industry is generally determined by two main critical factors, namely:

a. Value of energy content → CV (Calorific Value)
b. Environmentally friendly properties → TS (Total Sulfur)
For analysis purpose, Strategic Business Units (SBU) is classified based on the coal specification for further assessment based on market attractiveness and business strength.

Coal reserves in Indonesia accounted for 2.2% of the total world reserves. It is dominated by low and medium rank coal, which is mainly located at Eastern Kalimantan and Southern Sumatera Island. Besides the calorific value of coal as the critical factor, the total sulfur factor is also essential concerning the need for further use of Flue Gas Desulfurization (FGD). If the total sulfur is above 0.3%, then the FGD shall be implemented, which has an impact on the increase of the investment cost.

Based on the PLN RUPTL 2019 -2028, the coal consumption of PLN will reach 153 million Ton in 2028 from 97 million Ton in 2019, with an annual consumption growth rate of 5.2%. It is due to there is an additional capacity of 27.1 GW of new coal Coal-Fired Power Plant, accounted for 48% from a total installed capacity of 56.4 GW in 2028 [8]. It is noted that the market attractiveness of coal is still prospective because the need for coal supply for the power plant is still huge.

Based on the assessment of market attractiveness and business strength, the result is shown in table below.
Table 1. GE McKinsey Matrix Result.

| SBU    | Industrial Attract. | Business Strength |
|--------|---------------------|-------------------|
| HR HS  | 2.87                | 2.65              |
| HR LS  | 3.69                | 4.15              |
| MR HS  | 3.82                | 4.6               |
| MR LS  | 4.17                | 4.6               |
| LR HS  | 3.64                | 4.15              |
| LR LS  | 3.59                | 4.15              |
| VLR HS | 2.15                | 3.1               |
| VLR LS | 2.15                | 3.1               |

The strategy for each SBU is shown in the Figure 8 below. As the IPP of Coastal Steam Power Plant, not only developing Medium Rank Coal-based power plants but also HRLS (High-Risk Low Sulphur) coal which is still large in reserves and the coal price tends to fall and is very potential to be sold in the domestic market compared to being sold to the import market (which tends to start to leave fossil plants and increase the portion of renewable energy).

As an IPP for Mine Mouth Power Plant, starting to use Medium Rank Coal (not just Very Low-Rank Coal), considering that MRLS and MRHS coal is still very large. The transportation costs will decrease if MRLS and MRHS are used to supply PLTU MT so that the coal price will be very low. Additionally, the NPHR of the generator will also be very low considering that the coal used is Medium Rank instead of Low Rank and Very Low Rank, and the C component will be very low with the above combination.

As a trader, the priority is to secure coal supplies for HRHS, VLR HS, and VLR LS (if there is a PLN PLTU that uses typical coal) given the limited amount of coal reserves. Negotiating coal supply contracts (Coal Supply Agreement) for HRLS, MRLS, LRLS, MRHS, and LRHS if the currently agreed coal price is relatively high.

As the coal concession owner, Not only looking for low rank or very low-rank coal concessions to be acquired but also looking for medium coal rank (MRLS or MRHS) concessions, especially in Sumatra, which at current valuation will be of low value. Negotiating with the government to get an IUP / P2PKB concession that has expired, especially for typical coal: HRLS, MRLS, LRLS, MRHS, LRHS.

For the coal transporter business, the strategies are apart from being used by PLN Batubara. It also allocates a large barge or mother vessel to serve as a means of transportation for coal companies HRLS, MRLS, LRLS, MRHS, and LRHS, especially for coal companies that supply PLN generators.
Also, they shall stop long-term contracts with coal typical coal companies HRHS, VLR HS, and VLR LS, which will significantly reduce mining operational activities in the future.

4. Conclusions
Conclusions of this study are PJB has many portfolios in Coastal Steam Power Plant. In the future, PJB should not only develop Medium Rank Coal-based power plants, but also HRLS (High-Risk Low Sulfur) coal, which is still large in reserves and the coal price tends to fall; as an IPP for Mine Mouth Power Plant, the strategy is starting to use Medium Rank Coal (not just Very Low-Rank Coal) considering that MRLS and MRHS coal is still very large and power plant.

Actions that can be recommended are PJB should not leave the coal business-related portfolio due to many opportunities in the future; and PJB needs to create a task force for optimizing coal business-related portfolio.

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