

Financial Strategy Analysis for Development of Liquid Natural Gas LNG Power Plant to Replace Diesel Fuel Power Plant: Case Study LNG based PLTMG Tanjung Balai Karimun 3x4 MW

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Abstract: Many of the islands around Batam use diesel power plants (PLTD) to generate electricity. The cost of operating these plants is very expensive since they use expensive diesel fuel and tend to experience significant increases, so that it burdens the government and users if they subsidize the electricity tariff. PT XYZ intends to expand its business by becoming a supplier of electricity to the islands around Batam by using a Gas Engine Power Plant (PLTMG) to replace the existing PLTD on the islands. To determine whether the PLTMG construction has business feasibility, and the electricity tariff is cheaper than the PLTD tariff, research is carried out that focuses on the Business Feasibility for the PLTMG construction and the selection of gas transportation modes will be best to supply gas to the generating site. By using the economic feasibility parameters NPV, IRR, PBP and BCR and by conducting sensitivity analysis and risk management, it is expected that the results of this study will provide clear, safe, and comprehensive guidance for management in order to grow and develop their electricity business. After conducting a Technical Study and Business Feasibility Analysis, it was found that the PLTMG construction was feasible to be implemented on Karimun Island with a capacity of 3 x 4 MW using ISO Tanks and LCT ships to transport natural gas in the form of LNG. PT XYZ will benefit from the construction of a PLTMG of IDR17,327,179,295, - in the first year with an electricity tariff of IDR1.805/kWh. And when compared to the current PLTD electricity tariff of IDR 3,000/kWh, the PLTMG electricity tariff are much cheaper. In addition, this will also provide significant savings in the cost of providing electricity for PT PLN (Persero) WRKR of IDR106,775,640,000/year.

1 INTRODUCTION

1.1 Background

PT XYZ is a subsidiary of PT PLN (Persero) and experiencing a saturation phase in developing its business in its working area which is only on 3 islands: Rempang Island, Galang Island and Batam Island. With this limited working area and the impact of the covid 19 pandemic which has made electricity sales growth decline, further complicating the business conditions faced by PT XYZ.

There are 2 factors that need to be considered in finding solutions for business development, they are Internal factors and External factors. The following internal factors encourage the development of an off-grid electricity sales business i.e.:

- a) The electricity business area and IUPTL of PT XYZ are limited to Batam, Rempang and Galang. This area of business is quite narrow.
- b) The growth of electricity sales in Batam has started to decline due to economic growth in Batam which is not in good condition.
- c) Batam has started to enter a saturated condition as development for business, industry and housing is getting narrower.

Meanwhile external factors are the driving factors for finding new business development solutions, i.e.:

- a) Apart from Batam, Rempang and Galang, there are still many islands around the island of Batam that require electricity supply at a more economical rate.

- b) Currently the power plants in these islands operate PLTD that uses Solar Oil and MFO which are expensive and tend to increase.
- c) Currently, the availability of Fuel Gas in Indonesia and abroad is still quite abundant.

The existence of these 2 factors made the authors conduct research to determine whether the construction of PLTMG is feasible or not and produces electricity rates that are cheaper than PLTD electricity rates and how much potential profit can be obtained by the company.

1.2 Problem Statement

- a) What is the best transportation mode that can be used by PT. XYZ to transport gas in the form of LNG from Tg? Jabung to Balai Karimun?
- b) How is investment performance for PLTMG evaluated by Capital Budgeting?
- c) How competitive are the electricity tariff for LNG-based compared to diesel-fueled?

1.3 Objective

The main objectives of this paper are as follow:

- a) Determine and analyze the mode of gas transportation to be used.
- b) Analyze project investment and determine the best investment scenario.
- c) Determine how profitable the electricity tariff of LNG-based compared to diesel fuel-based.

2 THEORETICAL BASES

2.1 Conceptual Framework

To perform Financial Analysis in order to achieve the expected goals, a systematic financial analysis method is used and is commonly used by business people. The method used to perform financial analysis can be seen in Figure as below:

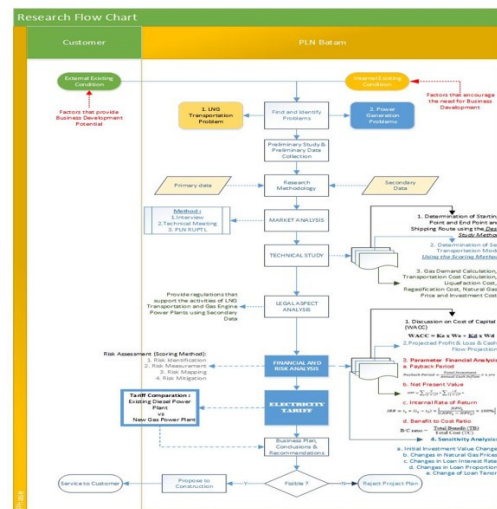


Figure 1.

2.2 Calculation of CAPEX, OPEX and ABCD Component Costs to Get Electricity Rates

To obtain data that will be used in financial analysis, what must be done first is to calculate data on CAPEX and OPEX costs for the construction and operation of PLTMG and then define them into ABCD components to facilitate analysis and get the value of electricity tariff in accordance with IRR is set at 11%.

2.3 Funding Scheme Calculation using WACC (Weighted Average Cost of Capital)

Related to business feasibility, capital composition is an important element. This project is planned to be funded through 30% equity and 70% loan from financial institutions with a period of 7 years. The weighted average cost of capital (WACC) is used by analysts and investors to assess an investor's return on investment in a company. Since most businesses run on borrowed funds, the cost of capital is an important parameter in assessing a company's potential net profitability. WACC measures a company's cost of borrowing money, where the WACC formula uses the company's debt and equity in its calculations. WACC is used by investors to determine whether an investment is profitable, while company management tends to use WACC in determining whether a project is feasible to run. WACC calculations can be done using a formula (Gittman, 2012):

$$WACC = K_e \times W_e + K_d \times W_d$$

where :
K _d : the market cost of debt
K _e : the market cost of equity
W _d : weighted capital proportion of equity market value
W _e : weighted capital proportion of debt market value

2.4 Economic Feasibility Parameters

The biggest benefit and objective of this research is to find out whether the construction of PLTMG can be a solution for the company's business development. For this reason, a Business Feasibility Study is carried out using business feasibility parameters as the analysis method.

The business feasibility parameters used in this study are:

a) *PBP (Payback Period)*

The payback period is the investment cost divided by the annual cash flow. The shorter the return, the more desirable the investment. On the other hand, the longer the payback, the less desirable it is. The formula used is:

$$Payback\ Period = \frac{Total\ Investment}{Annual\ Cash\ Inflow} \times 1\ yrs$$

b) *NPV (Net Present Value)*

NPV is the difference between the present value of the cash inflows and the present value of the cash outflows over a certain period of time. NPV is used in capital budgeting and investment planning to analyze the profitability of a projected investment or project. The formula used is

$$NPV = \sum \frac{C}{(1+i)^n} + \sum \frac{-C}{(1+i)^n} +$$

c) *IRR (Internal Rate of Return)*

IRR is a method used in financial analysis to estimate the profitability of a potential investment. IRR is the discount rate that makes the net present value (NPV) of all cash flows equal to zero in the discounted cash flow analysis. The formula used is:

$$IRR = i_1 + (i_1 - i_2) \times \left| \frac{NPV_1}{(NPV_1 - NPV_2)} \times 100\% \right|$$

d) *BCR (Benefit To Cost Ratio)*

BCR is a ratio used in cost-benefit analysis to summarize the overall relationship between the relative costs and benefits of a proposed project.

BCR can be expressed in monetary or qualitative terms. The formula used is:

$$B/C\ ratio = \frac{Total\ Benefit\ (TB)}{Total\ Cost\ (TC)}$$

3 RESEARCH METHOD

To get electricity tariffs that meet business feasibility parameters, it must first be understood about the PLTMG Production Cost structure as shown in the image below.

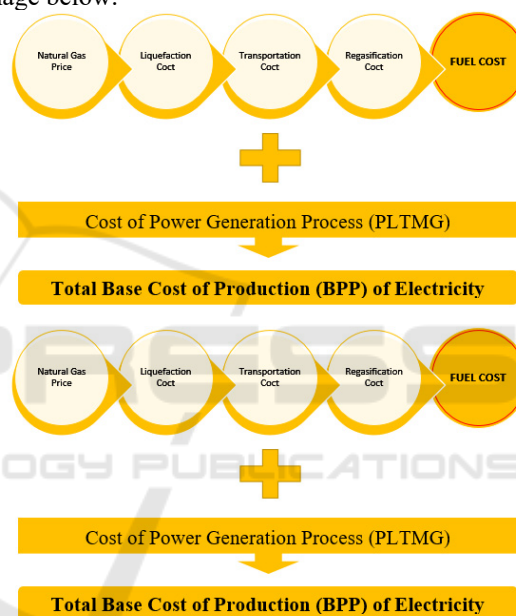


Figure 2.

The outline of the methodology for implementing the Feasibility Study for the Development of Liquefied Natural Gas PLTMG from Tanjung Jabung Jambi for Power Plants on Karimun Island and its surroundings includes :

- a) Collecting data and information related to the location and capacity of natural gas sources in Tanjung Jabung Jambi and the location of power plants and power plant capacity on Karimun Island.
- b) Collecting data and information related to transportation modes and ports around the location of gas sources and power plant locations.
- c) Determining sea shipping lanes with the desk study method.

- d) Techno-economic analysis and calculations for aspects:
- Technical Study on Selection of LNG Transportation Mode. Technical Study on the Selection of Gas Power Plants.
 - Calculation of Construction and O&M Costs of Power Plant.
 - Definition of ABCD components.
 - Determination of Electricity Tariffs with an IRR of 11%.
 - Business Feasibility Analysis based on 4 parameters, i.e.: Internal Rate of Return (IRR), Benefit to Cost Ratio (BCR), Payback Period (PBP) and Net Present Value (NPV).
 - Sensitivity Analysis with several sensitivity parameters.
- e) Make a comparison of electricity prices/kwh between PLTD and PLTMG using LNG.
- f) Obtain a statement of benefit and potential profit for the company.

Variable cost	2,702,665,306
Indirect Cost	744,000,000
Sub-Total	10,177,465,306

b) PLTMG

Description	Amount (Rp/Year)
General Affair and Management Cost	1,925,000,000
Operation & Maintenance Cost	5,359,200,000
Labor Cost	3,060,000,000
Property Insurance	334,950,000
Fuel Cost	107,918,566,184
Variable Cost	2,396,867,400
Sub Total Annual Cost	120,994,583,584

4 DATA ANALYSIS AND DISCUSSION

The first thing to do is to determine the initial assumptions from the data used as the basis for analyzing the feasibility of gas transportation modes of business and the construction of PLTMG. After conducting a Technical Study and Business Feasibility Analysis, the following results were obtained:

4.1 Initial Investment Cost (CAPEX)

- a) LNG Transportation: Rp 59,508,365,760
 b) PLTMG : Rp 135,481,769,640

4.2 O&M Cost

- a) B1. LNG Transportation

Description	Amount (Rp/Year)
Salaries for employees in	834,000,000
Employee Salary in spare parts	132,000,000
Loading & Rent &	904,800,000
	1,440,000,000
	3,420,000,000

4.3 The Agency of Change

Components	Value
Component A (Capital Recovery)	450
Component B (O&M Fix)	120
Component C (Bahan Bakar)	1,208
Component D (O&M Variable)	27
Total	1,805

4.4 Economic Feasibility Parameters

Components	Transportation	PLTMG
WACC	9.67%	9.67%
Net Present Value	3,473,673,773	8,964,082,475
IRR	11.02%	11.03%
Payback Period	6 Year 1 Month	6 Year 1 Month
Benefit Cost Ratio	1.73	1.73

Tarif	31,245 IDR/MMBTU	1,805 IDR/kWh
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4.5 Risk Mitigation Plan

There are 3 Risk Mitigation Plans that need more attention because they have a fairly high level of risk, as shown in the table below:

Table 1.

Risk	Mitigasi Plan
Suitability of purchasing electricity	Preparation of long-term contracts with a minimum purchase of electricity.
Decrease in the amount of electricity demand	1. Preparation of long-term contracts with a minimum purchase of electricity. 2. If the purchase of electric power is equal to the minimum power calculation, then the tariff charged is the same as the PLTD tariff, which is IDR 3,000/kWh.
PJTBL risk ends prematurely	Preparation of long-term contracts according to the age of the project with a statement of commitment from PLN WRKR regarding the minimum purchase of electricity with the amount and length of the period in accordance with the age of the project that was agreed at the beginning

PT XYZ must concentrate on the risk mitigation plan as mentioned above, to reduce the impact or ensure that the risk does not occur.

5 CONCLUSIONS

5.1 The Results of the Technical Study

From the results of the technical study, it was determined that:

- a) The choice of the type of LNG transportation from the gas source in Tanjung Jabung Jambi to the Generating site in Tanjung Balai Karimun Karimun Island is using ISO Tanks and LCT Ships because they have several advantages over using FSRU or FSO.

- b) The selection of the type of power plant with a capacity of 12 MW is to use PLTMG 3 x 4 MW because the power generation capacity is below 5 MW per unit and has a good heat rate so that the efficiency of the gas engine is high.

5.2 The Results of the Financial Study

From the results of the Financial Study, the following data were obtained:

- a) The cost of LNG transportation that is feasible is Rp. 31,245/MMBTU.
- b) The proper electricity tariff to be applied on Karimun Island is Rp. 1,805 /kWh.
- c) The electricity tariff using PLTMG fueled by LNG (Rp. 1,805/kWh) is cheaper than the electricity tariff using PLTD (Rp. 3,000/Kwh).
- d) The potential profit of the company is Rp. 17,327,179,295 in the first year.
- e) The maximum potential saving of User electricity production cost is Rp. 106,775,640,000 /year.

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