Investment Decision Analysis of LPG Trans-Shipment Project

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ABSTRACT

LPG demand for East Indonesia increases year by year; currently, the demands are being supplied by Ship to Ship (STS) in East Java that causes high costs due to the far distance between terminal and destination point in East Kalimantan and Sulawesi. Company XYZ, located in East Kalimantan, has an LPG storage facility and jetty that can be utilized to be an LPG hub to cover the demand in East Indonesia. This project will build an LPG Hub Terminal in East Kalimantan with the business scheme Build, Operate and Own (BOO) with a project lifetime of ten years. The investment project analysis is conducted to determine the processing fee and limitation volume to make the project run. Based on the financial model, this project is feasible to run with an IRR of 18.87%, NPV Rp 368.376.211.074, profitability index of 6.42, and a payback period of 5.9 years. This result is assumed for processing fee 11.9 USD/MT and 707.000 MT/year, and funding scenario is 80% debt and 20% equity. Based on the analysis, the most components affecting the project are processing fee, LPG volume, interest rate, maintenance cost, and salary. The scenario analysis is conducted to analyze the lowest processing fee and volume limitation. The lowest processing fee is 10 USD/MT with an LPG volume 707.000 MT/year limitation. Meanwhile, the limitation of LPG volume to run this project is 500.000 MT/year with a processing fee of 11.9 USD/MT. If the LPG volume is less than 500.000 MT/year, the project is not feasible to run.

Keywords: LPG, East Indonesia, LPG Hub Terminal, Financial Model, Sensitivity Analysis, NPV, IRR.

1. INTRODUCTION

LPG has the most significant portion of Indonesia's energy contribution, and it is used in industrial and household sectors. Since the kerosene to LPG conversion program started, the LPG demand trend has increased yearly. LPG demand increased by 16% on average per year. LPG is supplied by refinery production and import from other countries. The distribution of LPG in Indonesia use three main terminals:

1) Tanjung Uban for West Indonesia distribution
2) Teluk Semangka Ship to Ship (STS) for 3 Very Large Gas Carrier (VLGC).
3) STS Kalbut for East Indonesia distribution

Figure 1. LPG Supply Scheme in Indonesia

STS Kalbut as the main terminal is far from the distribution area (East Kalimantan and Sulawesi). This can cause high distribution costs. Ship to ship process also has a high-risk operation than the land terminal. Meanwhile, LPG demand in East Indonesia increases based on the forecast in Table 2. In 2040, the demand will become three times bigger than in 2021. STS Kalbut shall handle this demand while maintaining a safe operation.

Company XYZ is an oil and gas company in East Kalimantan with LPG storage and jetty to be utilized for the LPG Hub Project. This company needs to determine the processing fee value to compete with STS in East Java. In this paper, the financial model has been created to find the best processing fee and volume that can make this project is desirable to all parties.

2. LITERATURE REVIEW

2.1. Capital Budgeting

Capital budgeting is a method of allocating capital inside a firm for various investment opportunities. Capital budgeting decisions are crucial in establishing the business of a corporation [1]. The corporation must fund two expenditures as part of the capital planning process. Capital and operational expenditures are the two types of expenses. *Capital expenditure* is a cost that is intended to yield benefits over a more extended period than a year [2]. Meanwhile, the operational expense is an outlay that will pay off in a year [3].

In industry practice, there are several primary capital-budgeting methodologies or criteria:

1) Net Present Value (NPV)
   The net present value (NPV) represents the present value of the cash flow generated by the investing process [4]. The NPV must be more significant than the investment itself to satisfy the investors. The formula is as follows:
   NPV = Present value of cash inflows – Initial Investment   (1)
2) Profitability Index
   The profitability index (PI) is a cost-benefit ratio equal to the present value of future cash flows divided by the original cost of an investment [5].

Profitability index (PI)
$$= \frac{Present\ value\ of\ vuture\ cash\ flow}{Initial\ cash\ outlay} \quad (2)$$

* A PI of larger than one shows that the present value of future cash flows from the investment outweighs the cost of investing,

indicating that the investment should be accepted. Because it employs the same inputs, the PI and the NPV are closely related. The NPV will be positive if the PI is more significant than 1; hence the project should be approved.

3) Internal Rate of Return (IRR)
   The internal rate of return (IRR) is the discount rate that a corporation will earn if it invests in a project and receives the expected cash inflows. In other words, when the NPV value is zero, the value of IRR equals the discount rates [3]. The following is the formula:

$$\$0 = \sum_{t=1}^{n} \frac{CF_t}{(1 + IRR)^t} - CF_O \quad (3)$$

4) Payback Period

The payback period is used to assess a prospective investment by calculating the amount of time it will take to recoup its initial investment [6]. The payback period is calculated by dividing the initial investment by the project's after-tax cash flow.

5) Cash Flow

The net amount of cash and cash equivalents transacted in and out of a corporation in a particular period is known as cash flow. When a business generates positive cash flow, its liquid assets grow [7]. Any project's cash flows can be divided into an original investment, operational cash flow, and terminal cash flow.

2.2. Capital Cost

The minimum rate of return that a project must generate to raise the firm's worth is the cost of capital, which is the company's cost of financing. Investments that provide a higher rate of return than the cost of capital will increase in value since they are worth more than they cost. The cost capital of a corporation reflects the estimated average future cost of money throughout time and all financing activities.

The WACC (Weighted Average Cost of Capital) reflects the long-term average future cost of capital. The weighted average cost of capital (WACC) is simple to calculate: multiply each form of financing's cost by its proportion in the company's capital structure, then add the weighted values [8]. The following is the formula:

WACC = (kd x (1-T) x wd) + (ke x we)   (4)

Definitions:

- kd is the required rate of return on the firm's debt.
- T is the firm marginal tax rate.
- ke is the required rate of return of the firm's common stockholders and the cost of joint equity capital to the firm.
- wd is the fraction of the firm's total financing compromised by debt financing.
- we is the proportion of the firm's total financing comprised of common stock. For calculating Ke, Capital Asset.

Pricing Model (CAPM) is used with the formula:

$$Ke = Rf + (b \times (Rf - Rm)) \qquad (5)$$

Definitions:

- Rf is risk free rate return

- Rm is return on the market portfolio of assets.

2.3. Conceptual Framework

This research will conduct the financial modeling for the LPG Hub Project. The investment and operational costs will be identified using primary and secondary data. The revenue will be generated from the LPG volume processed by processing fee payment. The macroeconomy assumption will be used to form the financial model.
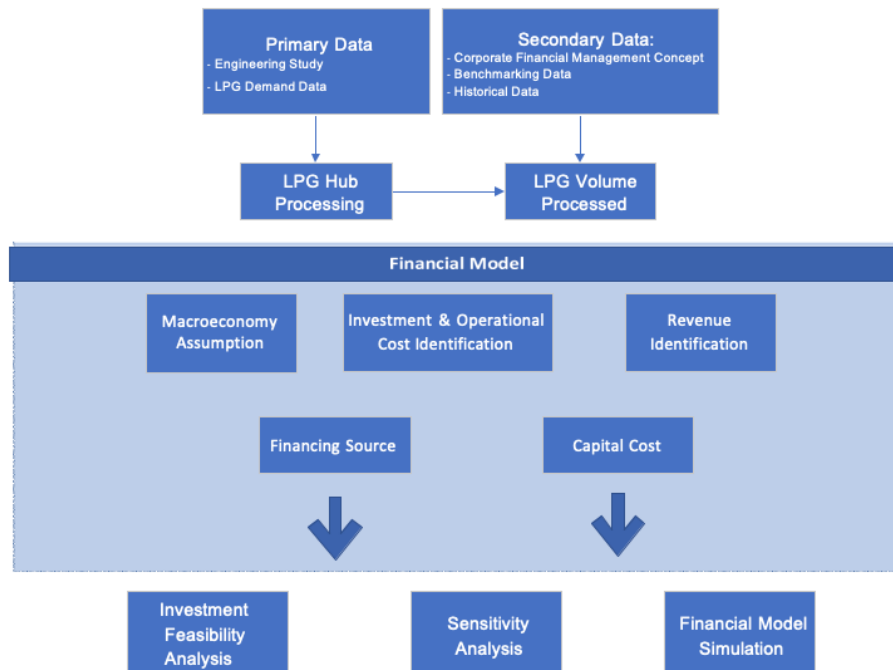
A financial model is a numerical or mathematical representation of a real-life company or financial issue. Financial modeling's common goals include assisting with company strategies, projections, project design, evaluation, selection, financial instruments, and financing decisions

Figure 1. Framework

3. RESEARCH METHODS

The research methodology that will be used is Financial modeling. From demand projection data, the revenue will be generated. The cost of revenue, purchasing a budget plan, and operating capital budget will help us know the profit and loss projection. Balance sheet projection will be generated by providing capital and financing budget, working capital, and fixed asset purchasing. The balance sheet and profit & loss projection will generate company performance such as financial ratio. The cash flow projection will also show the

company's performance; if the cash flow is negative, the company will take short-term debt. There are two free cash flows: free cash flow to equity and free cash flow to the firm. The free cash flow projection will give us the financial feasibility analysis using capital budgeting techniques.

The project risk assessment will be conducted using sensitivity analysis from the feasibility analysis. Sensitivity analysis is conducted to observe the most influenced variable in the cost of a project. This analysis will help Company XYZ to decide the lowest price and minimum LPG volume that can be

processed. This sensitivity will help Company XYZ make a strategy for running this project well or optimizing the cost.

The data for this research is collected based on the Engineering Team's capital expenditure. For Operating Expenditure, the data is collected using historical data and maintenance assumptions for the LNG plant. For demand projection, the data is generated using LPG demand data with some case scenarios that will help to simulate sensitivity analysis.

4. RESULT AND ANALYSIS

The LPG Hub Project will be analyzed using a financial model to find the feasibility of this project and the range of processing fees and LPG volume. After conducting financial feasibility, the risk assessment regarding the project will be delivered to understand.

4.1. Defining Assumptions

The cooperation concept for asset development used in this research is Build Operate Own (BOO). BOO is a public-private partnership in which a private organization builds, operates, and owns some facility or structure with some degree of encouragement from the government.

The business concept used for LPG Hub Terminal is Processing Agreement between Company XYZ with Pertamina C&T. Pertamina will send the Very Large Gas Carrier (VLGC) to XYZ Terminal. The LPG's will be stored in an LPG tank. The small ships come to XYZ Terminal from Eastern Indonesia to take the mixed LPG that has been processed. The LPG that has been processed will be charged by processing fee. This processing agreement duration is ten years.

Some assumptions for the financial model are below:

1) Income Tax Rate. Income Tax is 20% based on Peraturan Pengganti Undang-Undang No 1 Year 2020.
2) Inflation Rate. Based on Bank Indonesia Data, the inflation rate used is three years' average from January 2018 until December 2020. The inflation rate in this research is 2.75%.
3) Short Term Interest Rate. Short term interest rate that will be used is 6.5%.
4) Long Term Interest Rate. The long-term interest rate is 9.00% using an offering from Bank Mandiri and BNI for a nine-year loan with a three-year grace period.
5) Depreciation Method. The depreciation method used for Plant facilities is a straight line for 20 years and salvage value 20%. For equipment, the method is a double-declining balance with a duration of 16 years and a salvage value of 10%.
6) Risk-Free rate is 6.27% refer to Indonesia Government Bond
7) Risk Market Rate is 7.2% based on Damodaran risk market for oil and gas distribution.
8) The company that will be benchmarking is PT PGN due to the same industry in gas distribution.

4.2. Projected Demand and Processing Fee

The LPG processing quantity is projected by ten years of LPG demand in Eastern Indonesia. This data is calculated based on each area's demand. The table will show the LPG demand for each area in Eastern Indonesia based on LPG Hub Projected Demand Reference.

Table 1. LPG Demand in Eastern Indonesia per Area

Year	Kalimantan Timur	Kalimantan Utara	Gorontalo	Sulawesi Barat	Sulawesi Selatan	Sulawesi Tengah	Sulawesi Utara	Yearly LPG Demand
2020	151.010	26.099	30.880	29.451	277.122	57.889	80.886	653.337
2021	142.395	23.757	33.339	31.925	283.048	60.731	82.587	657.782
2022	147.284	25.946	35.851	33.129	284.351	66.992	85.254	678.806
2023	151.701	28.046	38.183	34.205	284.558	73.196	87.559	697.448
2024	156.213	30.134	40.492	35.275	284.702	79.612	89.844	716.270
2025	160.621	32.152	42.712	36.294	284.499	86.040	91.983	734.301
2026	163.918	33.758	44.481	37.039	282.541	91.529	93.273	746.541
2027	163.295	34.445	45.645	38.081	282.471	93.744	93.630	751.310

2028	162.708	35.168	46.711	39.073	282.370	95.690	93.908	755.628
2029	162.116	35.906	47.686	40.013	282.188	97.396	94.102	759.408
2030	171.545	43.131	42.056	40.846	302.999	77.994	89.942	768.513
2031	174.362	43.839	42.747	41.517	307.974	79.274	91.419	781.131
2032	177.224	44.559	43.449	42.198	313.030	80.576	92.919	793.956

Table 2. Projected LPG Demand & Processing Fee

Year	Projected LPG Demand (MT)	Processing Fee (IDR)
2022	678.806,35	173.740.000
2023	697.447,90	173.740.000
2024	716.270,33	173.740.000
2025	734.300,98	173.740.000
2026	746.540,60	173.740.000
2027	751.309,72	173.740.000
2028	755.627,77	173.740.000
2029	759.407,70	173.740.000
2030	768.513,30	173.740.000
2031	781.131,17	173.740.000
2032	793.956,21	173.740.000

The processing fee for LPG is decided flat rate 11.9 USD/MT or Rp 173.740,- per MT. Based on this price and projected LPG demand, the detail quantity and processing fee for this project is shown in Table 2.

4.3. Capital and Operating Expenditure

The required Capital expenditures (CAPEX) to install new LPG hub facilities as follows:

1) Fixed Assets:

    Capex of Plant: Rp 239.000.000.000,-

    Capex of Equipment: Rp 56.000.000.000,-

    Project duration is one year from mid 2021 to mid 2022, therefore the new facility will be on stream in mid 2022. The schedule of Capex as follows:

    - 2021 Capex of Plant: Rp 59.000.000.000,-

    - 2022 Capex of Plant: Rp 180.000.000.000,-

    - 2022 Capex of Equipment: Rp 56.000.000.000,-

2) Net Working Capital Requirement

    In 2021 prior to operation in 2022, an investment in NWC is required for the following year in 2022 is Rp. 11.835.664.150. The NWC is the difference between company's current assets and current liabilities.

This project's operating expenditure (OPEX) is associated with maintenance cost, consumables, salary & wages, and other expenses used in hub operation. Operating costs include the direct cost of revenue and other operating expense.

1) Cost of Revenue
    - Plant Maintenance
    - Consumables
    - Salary & Wages
2) Other Operating Expense
    - Commerce & Infrastructure Expense (Utilities and others)
    - General & Administration Expense
    - Other Expense

4.4. Cost Capital Analysis

In this project, the CAPM method uses benchmarking company: PT PGN with levered beta 2.52, Debt to Equity Ratio 0.93, and Monthly Market Return 0.53%. Beta shall be unlevered first before calculating the cost of equity; it is 1.44. Project Debt to Equity Ratio is 1.88. Therefore, using a formula, the levered beta for the new company is 9.55. With Risk-Free Rate 6.75% and Market Return 6.33%, Risk Premium is 1.84%, so the cost of equity is 13.40%. The minimum rate of return that a project must generate to raise the firm's worth is the cost of capital, which is the company's cost of financing.

Investments that provide a higher rate of return than the cost of capital will increase in value since they are worth more than they cost. The cost capital of a corporation reflects the estimated average future cost of money throughout time and all financing activities.

The weighted average cost of capital (WACC) is simple to calculate: multiply each form of financing's cost by its proportion in the company's capital structure, then add the weighted values. Based on the weight of capital and cost of equity calculation, the WACC is 9.35%, in the table below.

Table 3. WACC

WACC Calculation	Weight	Cost	Weighted Cost
Cost of Debt (After Tax)	65.24%	7.24%	4.70%
Cost of Common Stock	34.76%	13.40%	4.66%
WACC	9.35%		

If we compare the WACC with Pertamina Hurdle Rate 10.17%, it is below its value because the debt is smaller than this project. The IRR for this project shall be higher than WACC; therefore, the company can take profit from this project.

4.5. Capital Budgeting Analysis

Present value is one of the criteria in capital budgeting analysis [9]. WACC is used as the discount rate in the discounting process. For this project, the future cash flow is shown below. Based on the cash flow below, the NPV is Rp. 368.376.211.074-. The NPV is positive; therefore, the project is feasible to run.

The rate of return that the firm will earn if it invests in the project and receives the given cash inflows; it is the discount rate that equates to the NPV of an investment opportunity with $0 (because the present value of cash inflows equals the initial investment).

To accept the project, IRR shall be greater than the cost of capital, which is 9.35%. Based on the calculation in the cash flow in Table 12, the IRR is calculated by using the MIRR method because of more accurate. It assumes that positive cash flows are reinvested at the firm's cost of capital, and the initial outlays are financed at the firm's financing cost. The IRR value is 18.87%. It is far above the WACC; therefore, the project is feasible to run.

Meanwhile, the IRR to equity is calculated using free cash flow to equity data, the cost of equity-based on WACC calculation is 13.40%, in other hands the IRR for Equity is 15.24%. It is favorable for an investor because it is slightly higher than the cost of equity.

The maximum acceptable payback period length is ten years since the project is projected for ten years. Referring to the financial modeling that has been conducted, the payback period is 5.9 years. It means that in 2027, the initial investment has been recovered. Meanwhile, the payback period is 6.98 years for equity, one year after the firm returns its investment.

Based on the calculation, the payback period of the investment is 8.04 years. It means still below the project lifecycle; therefore, it is a good project that shall be implemented. In this project, the Profitability Index is 6.42. It means that the project shall be accepted.

4.6. Sensitivity Analysis

Sensitivity analysis is conducted for Salary, Maintenance Cost, LPG volume processed, processing fee realization, long-term debt interest rate, and inflation rate. The factor will be ranked to understand which is the most sensitive when the value is lower or higher than 20% [10]. The result of sensitivity analysis is shown in Table 4 and Figure 2.

Table 4. Sensitivity Analysis Result

	Current Assumption	+20% Swing	-20% Swing	Current NPV	+20% Swing NPV	-20% Swing NPV
Short-Term Debt Interest Rate	6,00%	7,20%	4,80%	368.376.211.074,35	368.376.211.074,35	368.376.211.074,35
Inflation Rate	2,75%	3,30%	2,20%	368.376.211.074,35	352.836.798.397,42	383.366.494.935,72
Maintenance Cost	100,00%	120,00%	80,00%	368.376.211.074,35	344.072.735.391,95	392.679.636.435,13
Salary	100,00%	120,00%	80,00%	368.376.211.074,35	328.115.820.076,82	408.636.463.978,38
Long-Term Debt Interest Rate	9,00%	10,80%	7,20%	368.376.211.074,35	298.983.431.341,94	455.253.192.653,50
LPG Volume Processed	100,00%	120,00%	80,00%	368.376.211.074,35	583.394.109.330,67	152.964.782.910,69
Processing Fee Realization	100,00%	120,00%	80,00%	368.376.211.074,35	584.017.974.299,70	152.728.034.830,43
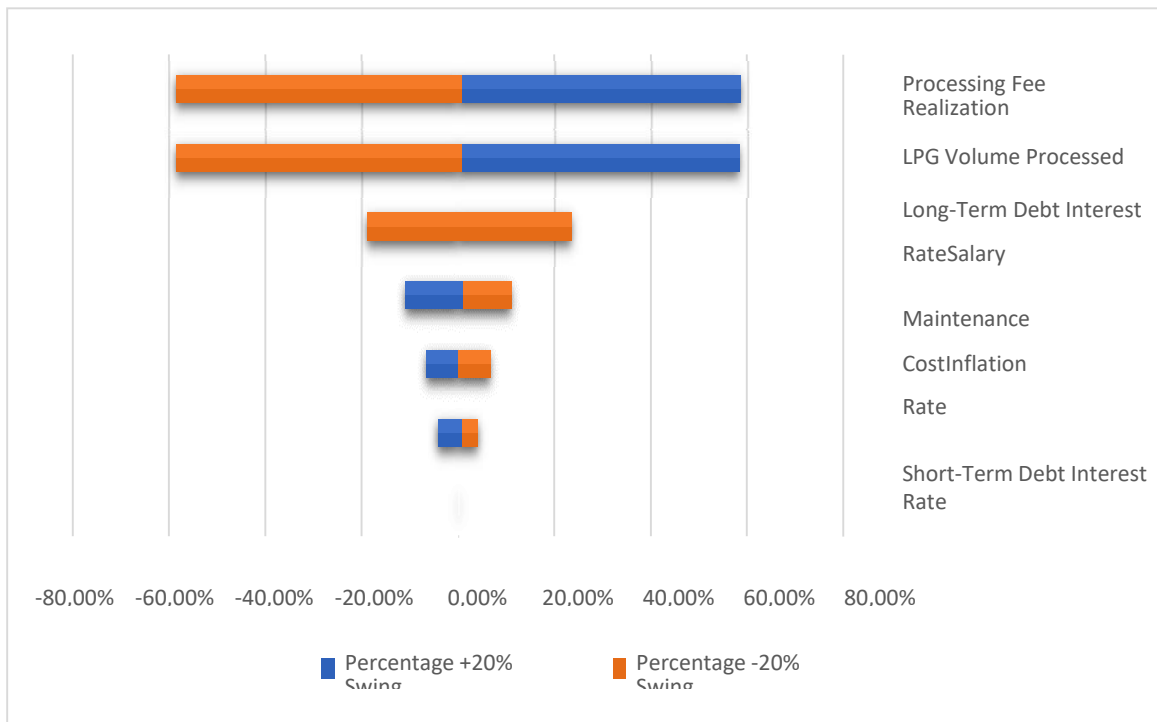
Figure 2. Sensitivity Analysis Result

The sensitivity analysis shows that the most sensitive factors are processing fee and LPG volume. They are related to the revenue of this project. If they are decreased to 80%, the NPV is still positive, and IRR is above WACC. The 3rd factor is Long Term Debt Interest Rate. The long-term debt interest rate is sensitive because 80% of Capital Expenditure is financed by long-term debt. Therefore, the small interest rate change affects NPV value significantly.

4.7. Scenario Analysis

In scenario analysis, there is 4 factor with four scenarios, The worst case, base case, best case, and Monte Carlo simulation [11]. For Monte Carlo simulation analysis will be explained in the next chapter. The factors used are LPG Volume processed, Processing Fee, Long Term Debt Interest, and Inflation Rate. The assumption of each factor is explained below:

1) LPG Volume Processed
   - Worst Case: 56.25% LPG volume processed due to expansion project of RDMP Balikpapan. This value is projected using the LPG forecast after the RDMP Balikpapan project.
   - Best Case: 106.72% LPG volume processed based on LPG demand growth rate.

2) Processing Fee Realization
   - Worst Case: 90%. The fee is expected to go down to 10.7 USD/MT or Rp 156.220 per MT.
   - Best Case: 126%. Company XYZ expects the fee can go up to 15 USD/MT or Rp 219.000- per MT.

3) Long Term Interest Rate
   - Worst Case: 9.74% based on the current rate and economic data inflation rate calculation.
   - Best Case: 7.57% based on the current rate and economic data inflation rate calculation.

4) Inflation Rate
   - Worst Case: 3.49% based on the historical inflation rate for three years.
   - Best Case: 1.32% based on the historical inflation rate for three years.

Table 5. Scenario Analysis

	Worst Case	Base Case	Best Case	Monte Carlo Simulation
	1	2	3	4
LPG Volume Processed	56,25%	100,00%	106,72%	95,54%
Processing Fee Realization	90,00%	100,00%	126,00%	107,74%
Long-Term Debt Interest Rate	9,74%	9,00%	7,57%	8,60%
Inflation Rate	3,49%	2,75%	1,32%	3,68%
NPV	(414.111.174.219,14)	594.833.669.130,39	7.924.398.840.573,54	

Based on the scenario result, the worst-case scenario shall be avoided because the NPV is negative. The parameter that has a significant impact on making NPV negative is LPG Volume Processed; in the worst-case scenario, the volume processed is 56.25%. If we apply it without any parameter change (base scenario), the NPV is still negative; a minimum volume that shall be applied is 65.80%, assuming that other parameters are the same as the base scenario. The project is not feasible with this scenario.

The processing fee is linear with volume; therefore, the limitation of both parameters shall be calculated to determine the minimum processing fee and volume. Figure 3 shows the minimum processing fee presentation is 65.8% with 100% volume applied, but when the volume is decreased, the processing fee shall be increased.
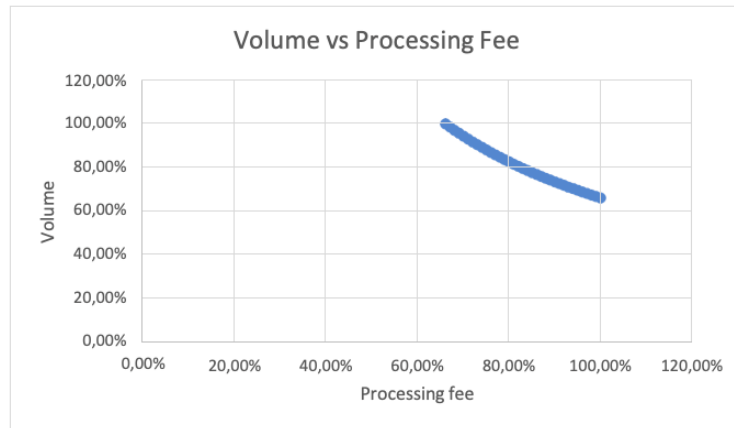
Figure 3. Volume vs Processing Fee Limitation

4.8. Monte Carlo Analysis

However, it is unlikely that all factors from the worst case and best case occurred simultaneously; thus, Monte Carlo simulation offers a probability check using a random value between worst case and best case. The Monte Carlo Simulation result is in Table 6.

Table 6. Monte Carlo Analysis Result

Descriptive Statistics	
Min	(215.480.236.095,39)
Max	1.683.855.857.092,83
Mean	407.471.838.058,24
Standard Deviation	298.651.375.271,17
Median	361.640.193.325,58
Kurtosis	0,62
Skewness	0,72
Prob NPV<0	8,62%

Based on the Monte Carlo simulation, the minimum NPV is negative, for maximum is Rp. 1.683.855.857.092. Meanwhile, the mean is Rp 407.471.838.058, close to the base scenario. The kurtosis is 0.62, and skewness is 0.72. The positive kurtosis shows that data distribution has a higher peak than a normal distribution. So, the data is not sloped.

Meanwhile, the skewness is positive with a value of 0.72, which means the data distribution tilt to the right of the normal distribution. It means the

NPV is likely positive. This project has probability when NPV is less than 0 8.62%. It is a risk that shall be taken to run this project.

Refer to the Monte Carlo analysis that has been conducted. The NPV tends to be positive. Although there is a probability of failure/loss, it is a good signal for a company or firm to run the project, although there is a probability of failure/loss. The risk of this project will be determined and measured; therefore, the mitigation plan can be known and implemented to prevent project failure.

4.9. Proposed Price & Volume Strategy

Based on the sensitivity and scenario analysis, price, and volume of LPG conducted, price and volume are the most sensitive factors affecting project financial condition. As explained in scenario analysis, when NPV is zero, the processing fee will be 65.8% of the actual fee (11.9 USD/MT), or 7.83 USD/MT, assuming 100% volume.

Alternatively, 704.000 MT/year shall be processed. In this case, there is no profit at all. Therefore, price and volume strategy shall be applied to make this project profitable and favorable for all parties.

Take or Pay strategy is a solution that can be implemented in this project. The strategy constrains the buyer to agree to a minimum LPG volume that shall be processed each year. Simulation for this strategy conducted with a constraint:

a) IRR is more than WACC
b) Profitability Index 2, 3, 4
c) Processing Fee 10 USD/MT and 10.7 USD/MT

Table 7. Take or Pay Scheme

Descriptive Statistics	
Min	(215.480.236.095,39)
Max	1.683.855.857.092,83
Mean	407.471.838.058,24
Standard Deviation	298.651.375.271,17
Median	361.640.193.325,58
Kurtosis	0,62
Skewness	0,72
Prob NPV<0	8,62%

Take or pay scheme is shown in table 22; there is two processing fee that can be proposed during negotiation to decide the processing fee. The first processing fee (10.7 USD/MT) can be proposed if the volume required is around 85%-90% from the initial design. If the processing fee should be cut off, the volume shall be around 90%-100% of the initial design. In the worst case, if the minimum volume is 500.000 MT, the processing fee shall be 11.9 USD/MT.

5. CONCLUSION

Based on the analysis after conducting financial projection for LPG Hub Project, this project is feasible to run with IRR 18.87%, NPV Rp 368.376.211.074, profitability index 6.42, and a payback period of 5.9 years. This result is assumed for processing fee 11.9 USD/MT and 707.000 MT/year, funding scenario is 80% debt and 20% equity, and with business, the scheme is Build-Operate-Own (BOO) contract during the project lifetime.

Based on the analysis, the most components affecting the project are processing fee, LPG volume, interest rate, maintenance cost, and salary. The risk measurement is conducted regarding these components, and results delayed project timeline and energy usage regulation as the highest risk. Management commitment and project monitoring are needed to ensure the project timeline is on schedule to mitigate the delayed project. Meanwhile, an extended contract agreement for project duration shall be applied to mitigate the energy usage regulation change.

For negotiation with the customer, the lowest processing fee is 10 USD/MT with an LPG volume of 707.000 MT/year. Meanwhile, the limitation of LPG volume to run this project is 500.000 MT/year with a processing fee of 11.9 USD/MT. If the LPG

volume is less than 500.000 MT/year, the project is not feasible to run.

REFERENCES

[1] L. Kengatharan, "Capital Budgeting Theory and Practice: A review and agenda for future research," *Am. J. Econ. Bus. Manag.*, vol. 1, no. 1, pp. 20–53, 2018, doi: 10.31150/ajebm.v1i1.5.

[2] I. Muda and R. Naibaho, "Variables influencing allocation of capital expenditure in Indonesia," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 126, no. 1, 2018, doi: 10.1088/1755-1315/126/1/012066.

[3] M. O'Connor, T. Lewis, and G. Dalton, "Operational expenditure costs for wave energy projects and impacts on financial returns," *Renew. Energy*, vol. 50, pp. 1119–1131, 2013, doi: 10.1016/j.renene.2012.08.059.

[4] O. Žižlavský, "Net Present Value Approach: Method for Economic Assessment of Innovation Projects," *Procedia - Soc. Behav. Sci.*, vol. 156, no. April, pp. 506–512, 2014, doi: 10.1016/j.sbspro.2014.11.230.

[5] M. A. Gurau, "The use of Profitability Index in Economic Evaluation of Industrial Investment Projects," *Proc. Manuf. Syst.*, vol. 7, no. 1, pp. 55–58, 2012.

[6] T. M. I. Mahlia, H. A. Razak, and M. A. Nursahida, "Life cycle cost analysis and payback period of lighting retrofit at the University of Malaya," *Renew. Sustain. Energy Rev.*, vol. 15, no. 2, pp. 1125–1132, 2011, doi: 10.1016/j.rser.2010.10.014.

[7] M. Faulkender, M. J. Flannery, K. W. Hankins, and J. M. Smith, "Cash flows and leverage adjustments," *J. financ. econ.*, vol. 103, no. 3, pp. 632–646, 2012, doi: 10.1016/j.jfineco.2011.10.013.

[8] R. A. Lambert, C. Leuz, and R. E. Verrecchia, "Information asymmetry, information precision, and the cost of capital," *Rev. Financ.*, vol. 16, no. 1, pp. 1–29, 2012, doi: 10.1093/rof/rfr014.

[9] B. Kelly and S. Pruitt, "Market expectations in the cross-section of present values," *J. Finance*, vol. 68, no. 5, pp. 1721–1756, 2013, doi: 10.1111/jofi.12060.

[10] H. C. Frey and S. R. Patil, "Identification and Review of Sensitivity Analysis

Methods," *Risk Anal.*, vol. 22, no. 3, pp. 553–578, 2002, doi: 10.1007/978-1-4615-3838-7_46.

[11]   T. J. B. M. Postma and F. Liebl, "How to improve scenario analysis as a strategic management tool?," *Technol. Forecast. Soc. Change*, vol. 72, no. 2, pp. 161–173, 2005, doi: 10.1016/j.techfore.2003.11.005.