

THE ANALYSIS OF CAPITAL BUDGETING MODEL FOR THE OVERLAND CONVEYOR AND SHIP LOADING FACILITIES PROJECT OF PT ABC

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ABSTRACT

The need for energy is one of the global needs. One source of energy is coming from coal conversion as a non-renewable energy resource with a low cost. Today, coal continues to be one of the most important source of electricity fuel in Indonesia. This is one of the main reasons for the business continuation and expansion of coal mining companies. PT ABC (the Company) is a coal mining infrastructure service provider that have been engaged with certain coal mining companies (the Client) for the utilization of the coal processing, transportation, and ship loading facilities based on rental contract. To continue serving its clients' needs with regards to the new area expansion, the Company have been starting to study the feasibility of new Overland Conveyor (OLC) and Ship Loading Facilities (SLF) project. The purpose of this study is to determine the feasibility of the OLC and SLF project and to examine the optimum project financing alternatives whether by fully equity-funded or by the combination between debt and equity. The capital budgeting model indicators: Payback Period, Return on Investment (ROI), Net Present Value (NPV), Discounted Payback Period, Profitability Index and Internal Rate of Return (IRR) were used to analyze the data, and sensitivity analysis. The analysis was done with three scenario includes 100% equity, Debt/Equity or D/E : 41%/59% and D/E : 80%/20%. Based on those analysis, it leads to the conclusion that the project is feasible for all the three scenarios of financing. The result shows the project has the lowest indicators' value with the fully equity-funded and produced higher value if the debt to equity ratio is higher. The sensitivity analysis was done to evaluate the volatility of relevant variables which might be affected the capital budgeting analysis result.

Keywords: Capital Budgeting, Net Present Value, Overland Conveyor, Sensitivity Analysis, WACC

INTRODUCTION

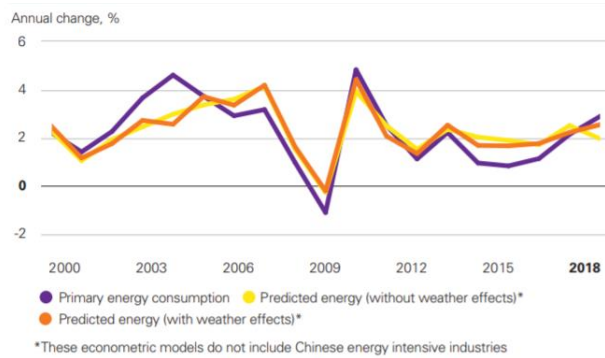
The risen of commodities prices within the 2000s have generated significant profits for companies that are engaged in the coal industry. Global coal price as shown on Figure 1 below was starting to decline since 2011 and it had been continued until the first half of 2016. On the second half of 2016, the coal price shown the increment and this was triggered by accelerated economic growth in both emerging and developing economies. Despite the rise, the global financial crisis in 2008 have changed the industry as a whole which caused a significant decrease in commodity prices. As coal account for nearly 50% of the total Indonesia export, this has limited the country's GDP growth in 2009 to 4.6%. From mid-2009 to early 2011, a sharp rebound in global prices occurred. However, reduced global economic activity has reduced the demand for coal, thus resulting in a downtrend of coal prices between early 2011 to mid-2016.

Figure 1 Global Coal Price Based on Global Coal New castle Index



Apart from some challenges faced by the coal mining industry such as the China restriction on coal imported policy and the rising of global awareness for renewable energy, many believe that coal will continue to play a significant role in the development of power generation in Indonesia over the next ten years due to the relatively low costs of construction and operation. The increase of demand in the future was mainly due to the increment in population as well as the rapid growth of business within the country, which will affect towards the demand for electricity.

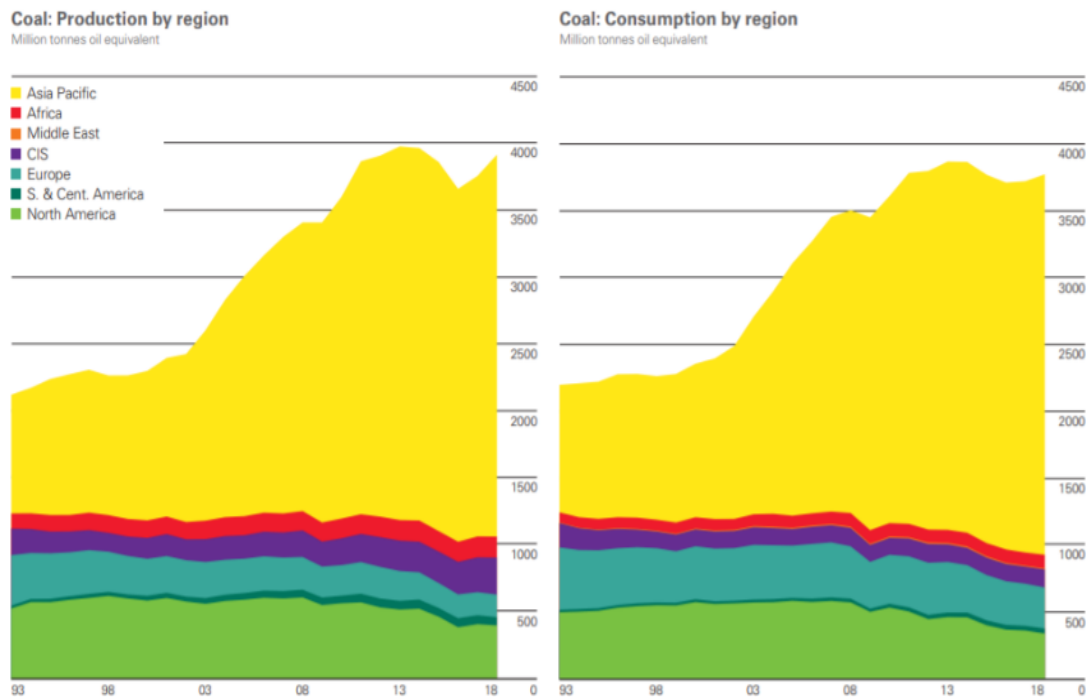
Figure 2 Global Energy Consumption 2000-2018



Source: British Petroleum, 2019

According to Statistical Review of World Energy done by British Petroleum, 2019, Figure 2 shows global primary energy consumption of 13,864.9 Mtoe (Million Ton Oil Equivalent) grew at a rate of 2.9% in 2018 compared to the year before. It almost double compared to 10-year average of 1.5% per year, and the fastest since 2010.

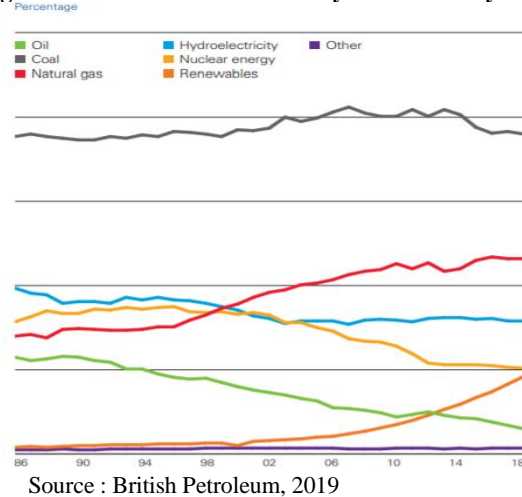
Figure 3 Global Coal Production and Consumption



Source : British Petroleum, 2019

Coal consumption grew by 1.4% in 2018, double its 10-year average growth. This consumption was led by India (36 Mtoe) and China (16 Mtoe). Coal's share in primary energy fell to 27.2%, its lowest in fifteen years. Global coal production rose by 162 Mtoe, or 4.3% of which China (82 Mtoe) and Indonesia (51 Mtoe) provided the largest increments (Figure 3).

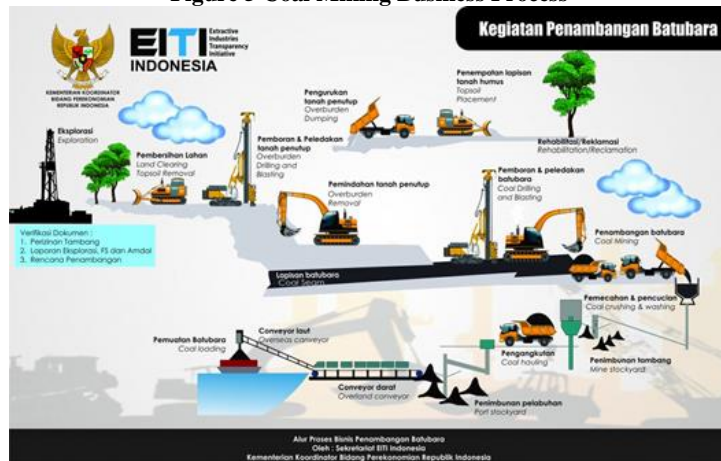
Figure 4 Share of Global Electricity Generation by Fuel



According to British Petroleum Statistical Review, 2019, world electricity generation rose by an above-average 3.7%, buoyed by China (which accounted for more than half of the growth), India and the US. Renewables accounted for a third of the net increase in power generation, followed closely by coal (31%) and then natural gas (25%). The share of renewables in power generation increased from 8.4% to 9.3%. Coal still accounted for the largest share of power generation at 38%, as shown above on Figure 4.

PT ABC (“the Company”), is an Indonesian publicly listed coal mining infrastructure service provider company, that have been engaged with certain coal mining companies (the Client) on the providing the coal processing, transportation, and ship loading facilities for years. Its activities mainly relate to the end process of the coal mining business process as shown on Figure 5. Coal processing is where raw coal from the mine is cleared using different physical processes, with or without any chemical reagents, to get a product which can be sold in the market or can be used for different purposes such as power generation. The finished coal that have been resized and ready to sell will be transport to the coal stockpile. If the concession area far from the coal port, the mining companies transport the coal by truck, overland conveyor, railway over the road or transport them by barge/vessel over the river.

Figure 5 Coal Mining Business Process



The Company also has a long and successful track record in coal processing, coal handling and coal port development with regards to support its clients. This is made the Company strengthen its network, reputation, track record and market position especially within Kalimantan with a number of advantages to the competitors. The competitive strengths have enabled company’s stability through the toughs and peaks of commodity cycles. In the attempt to strengthen the identity in integrated natural resources infrastructure, the Company runs three business unit which serves to support the Company’s development and growth in a sustainable manner. The Company also continues to expand its business unit by diversifying their integrated products and services in natural resources field.

Currently PT ABC owns a number of assets that helps its clients efficiently operate their business, which includes coal processing plants, overland conveyor system and coal handling ports.

To continue serving its clients’ needs with regards to the new area expansion, the Company have been starting to study the feasibility of new Overland Conveyor (OLC) and Ship Loading Facilities (SLF) project. Total investment cost of the project

approximately US\$ 335 million. Further to this planning, the Company need to conduct a financial study to assess the financial feasibility of the investment as well as to formulate the optimum financing strategy in order to get an optimum value of the project.

The purpose of this study is to determine the feasibility of the OLC and SLF project and to examine the optimum project financing alternatives whether by fully equity-funded or by the combination between debt and equity. The capital budgeting model indicators: Payback Period, Return on Investment (ROI), Net Present Value (NPV), Discounted Payback Period, Profitability Index and Internal Rate of Return (IRR) were used to analyze the data, and sensitivity analysis. The analysis was done with three scenario includes 100% equity, Debt/Equity or D/E : 41%/59% and D/E : 80%/20%.

LITERATURE REVIEW

Previous Research

Daryanto and Arifin (2018) use capital budgeting analysis to analyze and decide which option generates the most cost efficiency on the project located in specific area in West Java. According to Daryanto and Mentari (2018), capital budgeting indicators was used to measure the feasibility of its expansion plan of oil and gas industry investment project in a foreign country, Vietnam. Larinda Hakim (2018) uses capital budgeting analysis in the assessment of the development of oil pipeline project feasibility, and Almira Yuvita (2018) and also performed the analysis for the tug boat and barge project feasibility. Daryanto and Agitarini (2018) were using capital budgeting in analyzing and evaluating the options of cost efficiency for XYZ whether using a steel pipe or by using another pipeline system which polyethylene pipeline or polyamide pipeline system.

External and Internal Business Environment

Number of factors including economic condition and government policies are affecting the investment in Indonesia. Indonesia is a country that contains great economic potential that has not gone unnoticed to the majority of the international community. Indonesia - Southeast Asia's largest economy - is increasingly mentioned as an appropriate candidate to be included in the BRIC countries (Brazil, Russia, India and China) as the country is rapidly showing signs of similar newly advanced economic development. Indonesia's strong points that explain increasing foreign investments and the recent macroeconomic growth, including points below:

- Abundant and diverse natural resources
- Young, large burgeoning population
- Political stability (relatively)
- Prudent fiscal management since the late 1990s
- Strategic location in relation to the giant economies of China and India
- Low labor costs

Another key element that accounts for Indonesia's recent economic growth is domestic consumption. In line with rising per capita GDP and low borrowing costs, Indonesia's private consumption is robust. It accounted for 56 percent of the country's economic activity in 2011 and future projections indicate that it is to grow further.

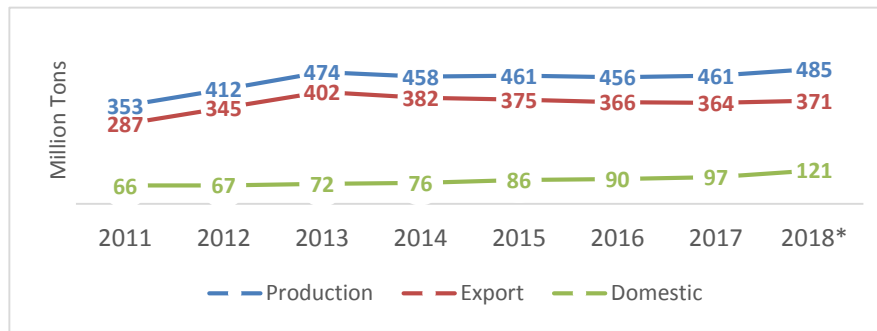
Figure 6 Total Indonesia GDP



Sources: World Bank, 2019

Mining sector contributes to the high proportion of Indonesia total export. Since 2005, the country is the leading thermal coal exporter which large portion of demand are coming from China and India.

Figure 7 Indonesia Coal Production 2011 - 2018



Among the challenges, many believe that coal will continue to play a significant role in the development of power generation in Indonesia over the next ten years due to the relatively low costs of construction and operation. Despite the challenges that the industry may face in the next couple of years, the IAE predicts that the demand of coal may increase in other countries such as India, Philippines, Vietnam and Malaysia. The increase of demand in the future was mainly due to the increment in population, which will affect towards the demand for electricity.

Overland Conveyor and Ship Loading Facilities

Overland conveyors (OLC) are belt conveyors that have been designed to carry high tonnage loads over long distances. In some cases, this mode of transportation might not be desirable but can be ideal for consistent movement of large volumes of material. In this case the OLC is transporting the coal from the mine until the port and the ship loading facilities are used to load the coal to the ship, barge or vessel.

The project is established to provide a more efficient transportation method to the coal mines surrounding the project area in Kalimantan. As trucks are being used by mining companies to transport coal to the nearest port, the project will build an overland conveyor in parallel to the existing hauling road.

Below are some advantages of developing of the OLC and SLF:

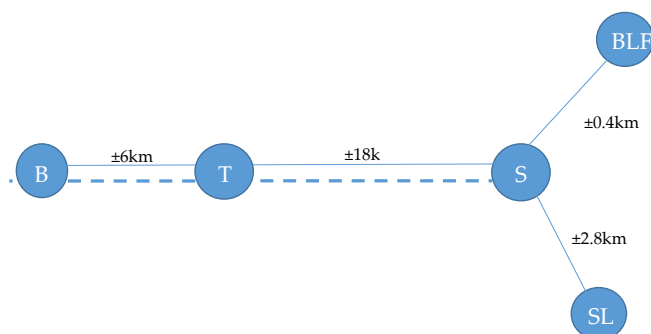
- Cost Efficiency – the total facility is expected to reduce coal-handling cost
- Eliminate Safety Risk – By constructing an overland conveyor, it will eliminate the majority use of trucks which will reduce the probability of road accidents
- Increase Capacity – The project can improve the transportation capacity to 30 Mtpa (million ton per annum)
- Improve Transportation Time – an overland conveyor is expected to reduce transportation time up to 667%
- Carbon Emission Reduction – More than 50% of Dump Truck.

The bulk material handling plays a big role in mining industry. The standard solution for this task today is the application of dumpers, but the application of a belt conveyor system should always be considered as an alternative solution. Both competing systems have to be compared with regard to the applicability, the financing and the running costs when developing new projects. Because of the high fuel prices and the long delivery times of the dumpers, which are highly demanded, belt conveyor systems become more and more attractive. Compared to dumpers with regard to operating costs, belt conveyor systems have enormous advantages. The ecological advantages of belt conveyor system is shown in an article by W.A. Gunthner, Ch. Tilke, and S. Rakitsch (*Energy Efficiency in Bulk Materials Handling*), which provides a comparison between a dumper and a belt conveyor system with regard to the carbon dioxide emission for two different conveyor lines.

Though the belt conveyor has great advantages as shown before and is considered as very energy efficient for transporting big quantities over a longer distance, improvement potential is possible. When such equipment is designed, the motion resistance flow into the calculation of the drive capacity. A consideration of the motion resistances shows the possible saving potential.

Project Profile

Figure 8 Project Map



- Length of the OLC +/- 24 Km (point B-T-S to BLF/SL)
- OLC from S to BLF capacity 12 Mtpa
- OLC from S to SL capacity 24 Mtpa
- Crushing plant with capacity of 15 Mtpa (at point B)
- Stock pile 600K ton (point S)

Basic Principle of Capital Budgeting

According to Gitman & Zutter (2010), Capital budgeting is the process of evaluating and selecting long-term investments that are consistent with the firm's goal of maximizing owners' wealth. Clark, Thomas & Robert (1989) wrote capital budgeting is a method used to analyze (identify and select) the feasibility of a project / long term investment that will be done by the company and is expected to generate benefits over a period of time greater than one year.

According to Daryanto & Agitarini (2018) there are six capital budgeting criteria decision tools including the techniques: 1) Payback Period 2) Return on Investment 3) Net Present Value 4) Profitability Index 5) Discounted payback period 6) Internal Rate of Return, each of which will be explained further.

• Payback Period

Payback period is a method used to determine the length of time it takes to recover our initial investment (Ross, Westerfield & Jordan, 2010). This method tends resulted the length of economic time of the investment be made. The longer the economic life investment pass through the payback period, then this investment will be more attractive.

This method is a tool to obtain a profit measurement but rather as a tool to measure the expected level of liquidity so that the project sequence can be obtained from those with the shortest period to the longest. This method is to be used as an initial selection tool for choosing investment projects (Lefley, 1997).

• Return on Investment (ROI)

ROI is a performance measure, used to evaluate the efficiency of an investment or compare the efficiency of a number of different investments. ROI measures the amount of return on an investment, relative to the investments' cost. If an investment's ROI is not positive, or if other opportunities with higher ROI's are available, these signals can help organization/company eliminate or select the best options (Daryanto & Mentari, 2018).

• Net Present Value

Net Present Value (NPV) is a method for evaluating the feasibility of a project that is most often used by companies. This method calculates the present value of money from the estimated future net cash inflows on the amount of investment value to be made (Anthes,2003).

The difference obtained between the value invested in the investment and the present value of the estimated cash inflows derived from the invested investment and that is what is called the net present value.

- **Profitability Index**

Profitability Index (PI) is the ratio of the present value of future free cash flows to initial expenditures (Arthur, 2005). Although the NPV investment criteria provide an absolute expected value of the investment, the profitability index becomes the relative expected measurement of the investment proposal, which is the ratio of the present value of its future benefits to the initial cost.

- **Discounted Payback Period**

The discounted payback period is the length of time until the sum of the discounted cash flows is equal to the initial investment (Ross, Westerfield & Jordan, 2010).

Every cash inflow is discounted back to the time when the investment was started, which is based on a percentage that reflects the concept of time value of money and uncertainty about future cash inflows. This percentage is the cost of capital of the company. The more uncertain of the future inflows, the higher cost of capital.

- **Internal Rate of Return**

The internal rate of return (IRR) is the discount rate at which the present value of expected cash inflows from a project equals the present value of expected cash outflows of the project. That is, the IRR is the discount rate that makes $NPV = 0$. IRR is sometimes called the time-adjusted rate of return. As in the NPV method, the sources of cash flows and the accounting treatment of individual cash flows are irrelevant to the IRR calculations (Ross, Westerfield, Jaffe, 2010).

Principally, a project that has IRR higher than cost of capital, then the project should be accepted in IRR method. The project should be rejected if IRR less than the discount rate (Ross et al., 2015). In this study IRR conducted from two calculation, the total present value of net cash flow and the initial outlays of the project. Subsequently run the number using IRR function in Excel and the result is the IRR from the project.

- **Sensitivity Analysis**

Sensitivity analysis involves the process of determining how the distribution of all possible returns for a particular project is affected by changes in one particular input variable, which is done by estimating the NPV of pessimistic, most likely and optimistic values of each variable. There is only one variable at a time that changes and is analyzed while the other variables are constant.

There are two general methods used to determine the variables at pessimistic and optimistic level. The first method is done by taking certain values for the estimated variables as an extension and pro forma forecasting technique, with the values taken representing of predictable events, either through a statistical approach, expert judgment or management opinion or with the limits of ability consideration.

The second method is to use a more mechanistic approach, where the level of the variable is chosen without reference to the trend of values in the future, but by setting the level of the variable value higher or lower than the value that is most likely to occur (Dayananda, 2002).

METHODOLOGY

To accomplish the study, the steps are: 1) Study the external and internal environment as well as the profile of OLC and SLF project; 2) Calculate and analyze the capital budgeting model indicators of the project; the results are: Payback Period (PP), Return on Investment (RoI), Net Present Value (NPV), Discounted Payback Period (DPP), Profitability Index (PI), and Internal Rate of Return (IRR) for 20 years period (2019 – 2039); 3) Make decision what option is the most feasible among the existing financing alternatives to construct the OLC and SLF; In this research, the primary data were collected in year 2019.

LIMITATION

Below are limitations related to this study:

1. The investment feasibility of the overland conveyor and ship Loading facilities is limited to the potential contract term and economic life of the asset that is 20 years time frame.
2. Some of the company and project profile given in this final project have been modified in keeping with the company's privacy policy.
3. Certain data and assumption made by the project team in the Company is for the purpose of project OLC and SLF project valuation that might be not applicable to other firms in the same industry.
4. This study is only focuses on financial aspects of the project within coal mining industry, it suggested to carry out the research in coal mining industry to get more generalize result and measure other aspects such as operational and technical.

RESULTS AND DISCUSSION

Based on the data provided by project team, the cost needed for the construction of OLC and SLF is US\$ 335,250,360. The assumptions used in the calculation of this study are 1) the time period is 20 years from 2019 to 2039; 2) the economic life is 20 years; 3) the depreciation type is stright line; 4) the terminal value is 0 (zero); 5) the tax is 25%; 6) WACC 100% equity is 14.17%, D/E: 41%/59% is 10.93%, D/E: 80%/20% is 7.89%.

Table 1 Result of Capital Budgeting Criteria

Item	Fully-equity funding (100% equity)		DER 70 % = Debt/Equity = 41% : 59%		DER 400 % = Debt/Equity =80 % : 20 %	
	Value	Unit	Value	Unit	Value	Unit
Payback Period	8.31	Years	8.55	Years	9.17	Years
ROI	12.1%	%	11.8%	%	11.4%	%
NPV	7,309,336	USD	107,357,418	USD	212,034,624	USD
Discounted Payback Period	18.53	Years	11.90	Years	10.40	Years
PI	1.03	x	1.63	x	4.49	x
IRR	14.54%	%	17.02%	%	22.75%	%

- Based on the above table, all payback period resulted the total period less than the length of the project term, that is 20 years. That means the project is “feasible” for all the three scenarios. The project with 100% equity shows the fastest return on the initial investment, that is 8,31 years, followed by D/E : 49%/51% of which payback period of 8.55 years. The longest payback period of 9,17 years is applied for the D/E : 80%/20%.
- Based on the above table shows the return on investment for generated profit every year during the contract period. For the three scenarios in overall the ROI is positive which means the project is feasible. The higher value of ROI then signifies the investment provides a much better return.
- Based on the above table, all NPV shows positive which mean that the net cash flow generated from the project is higher than the initial investment. Based on this numbers the project is “feasible” for all three scenarios, with the highest NPV as if the project financing is the combination between debt and equity of 80%:20%.
- Based on the above table, all discounted payback period resulted the total period less than the length of the project term, that is 20 years. That means the project is “feasible” for all three scenarios. The project with 100% equity shows the longest return on the initial investment, that is 18,53 years, followed by D/E: 49%/51% of which payback period of 11.90 years. The longest payback period of 10,40 years is applied for the D/E: 80%/20%.
- Based on the above table, PI Index for the three scenario is more than 1 which means that the OLC and SLF project is “feasible”.
- Based on the above, the IRR for the three scenarios are as follows:
 - 100% Equity => IRR 14.54% > discount rate 14.17%
 - D/E: 41%/59% => IRR 17.02% > discount rate 10.95%
 - D/E: 80%/20% => IRR 22.75% > discount rate 7.89%

All IRR shows above the discount rate for the respective scenario, means the project is “feasible”.

Based on the entire analysis results above, it can be concluded that the projects with 100% equity funding will provide results that meet feasibility. However, in the author opinion, if we saw the NPV number of only \$7,354,098 and the IRR resulted only 0.38% above the cost of capital, for the 20 years investment, is not attracted enough for the investor to invest on the project. Then we need the alternative strategies to make the project more feasible and attractive.

The other two alternative shows better result in all feasibility criteria that have been analysed. And based on the table above, the scenario of project financing with D/E: 80%/20% has the highest NPV, shorter Discounted Payback Period, higher PI Index and highest IRR.

Sensitivity Analysis

Four relevant variables have been determined to perform sensitivity analysis based on debt to equity ratio of 400%, they are including: rental rate, term of contract, construction cost, and electricity cost. The scenarios of the above variables are:

Table 2: Sensitivity Analysis Scenarios

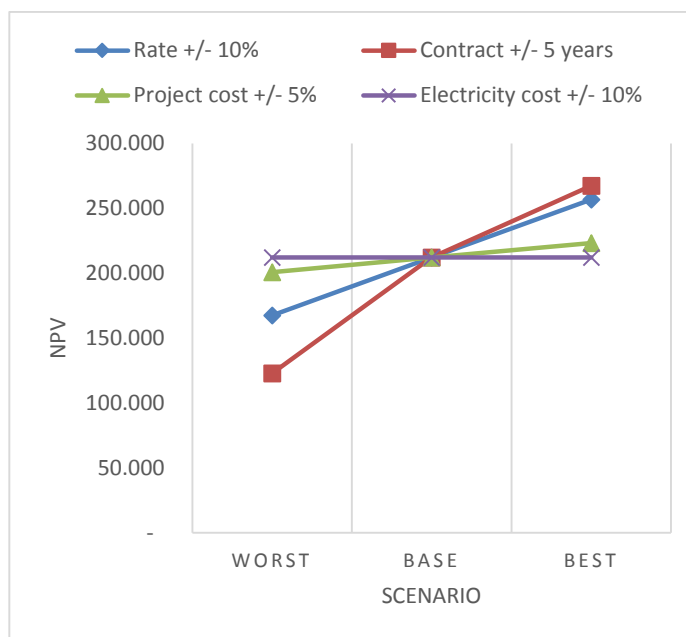
Relevant Variables	Worst	Base	Best
Rental rate	↑ 10%	\$ 7 per tonne	↓ 10%
Term of contract	↓ 5 years	20 years	↑ 5 years
Project cost	↑ 5%	\$ 335,250,360	↓ 5%
Electricity cost as the major part of operational cost	↑ 10%	\$ 0.095 per Kwh	↓ 10%

Table 3: Sensitivity Analysis Result

Capital Budgeting Criteria	Unit	Worst				Base	Best			
		Rate +/- 10%	Contract +/- 5 years	Project cost +/- 5%	Electricity cost +/- 10%		Rate +/- 10%	Contract +/- 5 years	Project cost +/- 5%	Electricity cost +/- 10%
Payback Period	Years	9.62	8.67	9.17	8.67	9.173616	7.65	8.67	8.11	8.67
Return on Investment	%	9.84%	7.60%	11.35%	11.39%	11.39%	12.93%	12.44%	11.43%	11.39%
NPV	USD (in million)	167.38	122.84	200.82	212	212	257	267	223	212
Discounted Payback Period	Years	10.8	9.9	10.29	9.9	10.40	8.95	9.9	9.43	9.9
Profitability Index	x	3.76	3.02	4.31	4.49	4.49	5.22	5.40	4.67	4.49
Internal Rate of Return	%	19.84%	20.31%	21.67%	22.75%	22.75%	25.57%	23.36%	23.87%	22.75%

From the sensitivity analysis, it shows that the change of term of contract are sensitive to affect the NPV and PI index from most base scenario. While the change of rental rate are sensitive to affect the PP, DPP and IRR from base scenario.

Figure 9 Sensitivity Analysis to NPV Result



Based on the results of the sensitivity analysis above, a number of things can be concluded as NPVs are most sensitive to changes in term of contract, which can be described from the largest gradient or the steepest slope line, followed by the change of rate, project cost and the last is operating costs that seems not too sensitive affecting the NPV result. Based on the above numbers, we got the changing in all of the above still make the project feasible.

CONCLUSIONS AND RECOMMENDATION

The purpose of this study is to assess the financial feasibility of the project of the construction of Overland Conveyor and Ship Loading Facilities, based on capital budgeting criteria in terms of Payback Period (PP), ROI, Net Present Value (NPV), Profitability Index (PI), Discounted Payback Period (DPP) and IRR. The data used for the analysis collecting by PT ABC in 2019. The analysis shows that by using 100% equity the project is meet feasibility criteria. Further to the assessment it also performs other alternatives if the project was financed by the combination between debt and equity to generate the higher value of the project. The feasibility of the projects based on calculation capital budgeting criteria shows that the combination of sources of project financing between debt and equity resulted the higher financial feasibility value. The higher debt to equity ratio the better feasibility of the project. The result showed that with the debt to equity ratio of 400% or Debt/Equity: 80/20, gives the Payback Period of (8.67 years), ROI (11.4%), the highest number of NPV (US\$ 212,177,319), the highest number of Profitability Index (4.49x), the shortest Discounted Payback Period (10.4 years), and the highest value number of IRR (22.75%).

Based on the sensitivity analysis result within the range of change of each relevant variables on the sensitivity scenario, the result for all the requirement capital budgeting criteria are still acceptable. So the project is still feasible even in the worst scenario. It is recommended to use the qualitative method and explore another country or industry in the future research, therefore, the data can be more comprehensive in term of getting a broader picture about the benefit using capital budgeting model with sensitivity analysis for the feasibility study.

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