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Economic Potential of Renewable Energy with a Financial Feasibility Approach in Kupang, NTT

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ABSTRACT

The use of biomass as fuel at PLTU Bolok can reduce emissions, save basic costs for providing electricity and increase fuel alternative competitiveness for PLN. A lot of unproductive vacant land can now be used to plant calliandra trees and used for cofiring, the use of woodchip biomass for cofiring PLTUs can also build a community economy. This research aims to analyze the feasibility of investment using a financial aspect approach in the biomass procurement program in Kupang, NTT. This business feasibility analysis was carried out to find out whether the biomass development plan was feasible from a financial aspect. This research will analyze the Net Present Value (NPV), Net Benefit Cost Ratio (BCR), and Payback Period values for the business.

Introduction

Electricity is a basic need of the community, where almost all equipment to support community life requires electrical energy. In Indonesia, most of the electricity is generated by Steam Power Plants (PLTU) (Al Hakim, 2020). In addition to the positive impact of PLTU as a power producer, it turns out that there is a negative impact of PLTU's electricity production process, namely exhaust gas emissions. Coal-fired power plants are ranked 5th (39.8%) as a source of air pollution (Nelly et al., 2023).

Several coal-fired power plants in Indonesia currently use biomass for the main fuel mixture, which can affect the reduction of the amount of exhaust gas emissions. One of the biomass materials used is a type of woodchips, which are pieces of wood that have been processed previously so that they can be used as fuel mixtures for coal-fired power plants (Wardana, Qomaruddin, & Soeroto, 2021). Woodchips as a co-firing biomass of coal-fired power plants do not contain sulfur like coal, so they can reduce coal-fired power plant exhaust emissions. In addition, the production of Woodchips biomass also helps improve the community's economy from the process of planting energy forests as raw materials for Woodchips (lamtoro, Gamal, and kedondong plants) and also the management of wood production sites into Woodchips (Setyono, Mardiansjah, & Astuti, 2019).

From the results of existing research, the island of Timor currently has 11,166 hectares of energy forests (producing woodchips) and has the potential to develop up to

126,620 hectares. From the data, it is known that the production of woodchips from energy forests can reach 244 tons/day or 9% of the biomass mixture for coal-fired power plants on the island of Timor.

This research will discuss the financial benefits of investing in wood management/production sites into Biomass Woodchips as raw materials for coal-fired power plant fuel mixtures. So that it can attract the interest of entrepreneurs.

Research Methods

This study will analyze financial benefits using the Net Present Value (NPV) method, Benefit Cost Ratio (BCR), and Payback Period. The data collection technique is to collect data from the Biomass Woodchips production site for 3 months.

Perhitungan Net Present Value (NPV)

NPV is the present value of all funds expected to come in, minus the present value of all cash outlays (initial investment). The NPV calculation involves the use of a discount rate that reflects the cost of capital or the desired rate of return. In this case, the discount rate used is 30% annually.

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$$\text{NPV} = \text{-Rp192,054,102.82}$$

After calculation, the NPV shows a negative value of Rp -192,054,102.82. This indicates that assuming an expected rate of return of 30% per year, the project is considered unprofitable as NPV < 0.

Benefit Cost Ratio (BCR)

Benefit Cost Ratio (BCR) is a comparison between the present value of the benefits obtained and the costs incurred. If the BCR exceeds 1, then the investment is considered feasible.

$$\textbf{BCR} = \frac{Rp\ Profit}{Rp\ Investasi}$$

Information:

1. Initial Investment Cost = IDR 2,500,000,000,-
2. Annual Income = Average Income/month x 12 = IDR 947,606,064,-
3. Factory Lifetime = 5 Years
4. BCR > 1 (Eligible), BCR < 1 (Not Eligible)

$$\text{Nilai BCR} = \frac{947.606.064\ x\ 5}{2.500.000.000} = 1{,}89$$

The calculation results show that the BCR value is 1.89, which indicates that the benefits obtained from this investment exceed the costs incurred. With a BCR value > 1, this indicates that the investment is considered feasible or profitable according to the BCR criteria.

Results and Discussion

The data obtained from one of the woodchips producing places/factories is as follows (Table. 1):

Table1

Bulan	Tahun	Produksi Woodchips (Ton)	Harga / Ton (Rp)	Pendapatan (Rp)	Biaya Produksi (Rp)	Pendapatan Bersih (Rp)
Januari	2024	512	Rp 700,000.00	Rp 358,400,000.00	Rp 275,000,000.00	Rp 83,400,000.00
Februari	2024	467	Rp 700,000.00	Rp 326,900,000.00	Rp 275,000,000.00	Rp 51,900,000.00
Maret	2024	538	Rp 700,000.00	Rp 376,600,000.00	Rp 275,000,000.00	Rp 101,600,000.00
Rata - Rata		505.7	Rp 700,001.00	Rp 353,967,172.33	Rp 275,000,000.00	Rp 78,967,172.33

Information:

1. Price/Ton (Rp): Selling price to Steam Power Plant (PLTU)
2. Production Cost: Purchase price of raw materials, equipment maintenance costs, fuel costs for cutting tools, employee salaries, etc.
3. Initial Investment (Building and Production Machinery) is IDR 2,500,000,000,-

Payback Periode

Payback Period is the period of time required to return the initial investment from the net income generated. The shorter the payback period, the more profitable it is.

$$\textbf{Periode} = \frac{Investasi\ Awal}{Keuntungan/tahun}$$

Information:

1. Initial Investment Cost = IDR 2,500,000,000,-
2. Annual Income = Average Income/month x 12 = IDR 947,606,064,-
3. Factory Lifetime = 5 Years
4. Payback Period < 5 years (eligible), Payback Period > 5 years (not eligible)

$$\textbf{Payback Periode} = \frac{2.500.000.000}{947.606.064} = 2{,}6$$

The Payback Period calculation result of 2.6 years is shorter than the 5-year time limit, indicating that this investment is considered feasible. This means that the investment can be said to be profitable based on the Payback Period criteria because the investment return period is less than 5 years.

According to Kasmir and Jakfar (2012) in (Ristantri & Supriono, 2020), a business feasibility study is an in-depth process that aims to evaluate a business or business to be run, with the main objective of determining whether the business is feasible to run or not. This process involves a thorough analysis of available data and information, which is then measured and calculated using certain methods. Furthermore, the objectives of conducting a business feasibility study include:

1. Avoiding the risk of loss, because by conducting a feasibility study, potential losses can be identified and anticipated early on, so that the risk of loss can be minimized.

2. Facilitate planning, with a feasibility study helping to develop a more structured and realistic business plan based on accurate data analysis.
3. Facilitate the implementation of work, because of good planning, the implementation of work becomes easier and more directed.
4. Facilitate supervision, feasibility studies provide a clear framework for supervision, making it easier to monitor business progress and performance.
5. Facilitates control, because with a feasibility study, control over various aspects of the business becomes more effective, because there are already guidelines and standards set from the start.

To test the feasibility of the investment, this study uses three evaluation methods, namely Net Present Value (NPV), Benefit-Cost Ratio (BCR), and Payback Period. Each method provides a different perspective on investment feasibility. The following are the results of the investment feasibility study for the management and production of wood into Biomass Woodchips as raw material for the Bolok PLTU fuel mixture in Kupang, NTT. First, the calculation results using the NPV method show that this method considers the time value of money. Using a discount rate of 30% per year, the present value of the expected annual income over five years is calculated, then reduced by the initial investment. The calculation results show that the NPV is IDR -192,054,102.82.

This result indicates that the investment is not profitable, as the present value of future net cash flows is less than the initial investment cost. The negative NPV indicates that, assuming the desired annual rate of return is 30%, this investment does not generate enough value to cover the initial costs and provide the expected rate of return. Therefore, from an NPV perspective, the investment is not viable. To achieve a positive NPV, the desired annual rate of return must be less than 26%. Thus, the investment in the management and production of wood into Biomass Woodchips as a raw material for the power plant fuel mix shows that this investment is not viable.

This NPV calculation is in line with research by (Ridwan, Romli, & Soeroto, 2022), which shows that if the NPV value is greater than zero or positive, then the project will provide greater benefits so that the investment is accepted or feasible to run. NPV results as an investment feasibility analysis are also applied to Mixue sharia franchises in Indonesia. The NPV method shows that if NPV> 0, then the Mixue franchise is considered feasible as an investment for franchise business people in Indonesia. In the NPV calculation for the Mixue franchise, within a period of 12 months, the optimal point is obtained in the 9th month (Sofwan, Putra, & Efendi, 2023).

The second stage is the Benefit Cost Ratio (BCR) test, which calculates the ratio between the total expected benefits and the total costs incurred. The BCR result value produces a value of 1.89, indicating that the expected benefits of this investment are 1.89 times the initial investment cost. Because the BCR value is greater than 1, investment in the management and production of wood into Biomass Woodchips as a raw material for the PLTU fuel mixture is considered feasible.

Research by (Hidayat, Winardi, & Nugroho, 2019) supports this by stating that if the BC Ratio is greater than 1, then the benefits generated over the economic life of the

project exceed costs and investments, making the project favorable. However, if the BC Ratio is less than 1, the benefits generated are not enough to cover the costs and investment, making the project unfavorable. Investment feasibility testing using BCR has also been carried out previously by (Rejekiningrum & Saptomo, 2015), who analyzed the financial feasibility of a solar-powered automatic disc irrigation system for agricultural development. The results of the analysis showed BCR values between 1.34 and 3.78, indicating that the solar-powered automatic disc irrigation system for the development of commodities such as mangoes, sugar apple, grapes and chili is very feasible to implement (Pattiapon et al., 2021).

The third investment feasibility was tested using the Payback Period method. Payback Period measures the time required to return the initial investment from the expected annual income. From the calculation results, it was found that the Payback Period is 2.6 years. Since the Payback Period value is shorter than the economic life of the project, which is 5 years, this indicates that the investment is feasible. Therefore, based on this analysis, the investment in the management and production of wood into Biomass Woodchips as a raw material for PLTU fuel mixture is considered feasible.

This result is in line with the statement according to (Abuk & Rumbino, 2020), if the Payback Period is shorter than the project life, then the investment is feasible. The feasibility of investment using the Payback Period method has also been carried out previously in research by (Ristantri & Supriono, 2020) on the property project of PT Kharisma Katulistiwa Hijau. The Payback Period calculation results in a value of 1.70, which indicates that the time required to return the investment is smaller than the investment period, so this investment is feasible.

The results of this analysis confirm the importance of considering all investment metrics together in decision-making. While a negative NPV indicates risk, a positive BCR value and a short Payback Period may indicate that the investment is worth considering, especially if the investor is willing to lower the desired rate of return or has a higher risk tolerance. Therefore, the final decision should be based on the risk assessment as well as the investor's preference for the rate of return and payback period. Another consideration is that in addition to providing economic potential for entrepreneurs, biomass production also contributes to the improvement of the community economy through the process of planting energy forests as a source of raw materials.

Conclusion

From the results of the Net Present Value (NPV) calculation assuming a profit of 30% per year, the Woodchips production plant is not feasible to maintain. For the value of profit assumption so that the NPV value is in the feasible category, the profit value is < 26% per year.

For analysis using the benefit-cost ratio (BCR) value, if the results obtained are > 1, then investment can be said to be feasible. Likewise, from the results of the analysis using the Payback Period, the results of the payback period < the Factory Lifetime so that the investment can be made is feasible. In addition to having economic potential for

entrepreneurs, biomass production also helps improve the community's economy from the process of planting energy forests as raw materials.

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