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Analysis Eligibility Calculated Solar Panel Investment based on Payback Period and Depreciation at PT. ABC

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Abstract. Solar energy has become one of the most important solutions in efforts to overcome the energy crisis and environmental problems facing the world today. This research aims to explore the use of solar panels as an efficient and sustainable renewable energy source. This study examines various types of solar panels energy conversion efficiency, and the latest technology in solar cell development. In addition, this research also analyzes factors that influence solar panel performance, including weather conditions, orientation and installation angle. Using solar panels with an average of 3 hours sunlight/day can reduce company operational costs by 5% for electricity usage each month.Solar panel maintenance costs are also relatively efficient because it is assumed that a maximum of 3 panels are replaced in a year if there is damage.

Keywords: *Investment Analysis; Payback Period*

A. INTRODUCTION

Energy is one of need supporting basis various activity humans and development economy. In the middle increasing request global energy, the challenges faced No only in matter supply energy but also the impact environment caused by use source energy conventional such as coal, oil earth, and natural gas. Burning material burn fossil This produce greenhouse gas emissions glass that contributes to change climate and pollution air. For overcome problem this, the world begins switch to source energy more renewable clean and sustainable. One of the source energy renewable which has potential big is energy the sun is known as energy solar. Energy solar, as one of the source energy abundant and sustainable renewable, offering solution potential For overcome crisis energy This. Solar panel technology, which changes ray sun become electricity, has develop rapid in a number of decade last. Improvement efficiency and reduction cost solar panel production make technology This the

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more interesting for various countries in the world, including developing countries that have access ray abundant sun throughout year. Energy solar is energy that comes from radiation sun and can changed become energy electricity through Photovoltaic technology or concentration solar. Generator electricity power solar (PLTS) becomes promising solution For provide energy friendly electricity environmental and sustainable.

Generator electricity power solar utilizing solar panels made of from cells *Photovoltaic* For convert ray sun direct become electricity. Technology This Keep going develop with innovations new that improves efficiency and reduce cost production as well as installation. Along with development This, PLTS is increasingly Lots used in various countries, including Indonesia, which has potential energy very sunny big Because position geographically. Indonesia, as an archipelagic country located on the equator, has potential energy very sunny big. Exposure ray consistent sun throughout year make Indonesia ideal for development solar panel technology. However, even though its potential large, the adoption of solar panels in Indonesia is still relatively low. Various challenge like cost investment high start, limitations infrastructure, lack of awareness society, and obstacle regulations and policies need overcome For maximize utilization energy solar. With position geographically located on the equator, Indonesia receives ray abundant sun throughout year, making it ideal candidate for development energy solar. Potential big This Not yet utilized optimally, even though government has show commitment For increase portion energy renewable in mix energy national through various policies and programs. Need realized that source energy based on fossil a moment will finished. Because of that that, fast or slow Government must leave source energy fossils and turn to sources energy new and renewable. The more decrease production energy based on fossil especially oil earth as well as global commitment in subtraction greenhouse gas emissions glass, government push improvement role energy new and updated in a way Keep going continuously as part in guard resilience and independence energy. Based on Regulation Government Regulation No. 79 of 2014 concerning Policy National Energy, Government target mix energy new and renewable in 2025 at least 23% and 31% in 2050. Solar panel installation is investment that can give savings cost significant operational. With reduce dependence on sources energy external, stabilizing cost energy, and utilize incentive government, solar panel users can enjoy cost more operational low and stable. Besides that, with minimal maintenance and potential For sell energy excess, solar panels No only help in press cost but also can become source income additional. Through various method this, solar panel offer solution efficient and economical energy For various sector.

One of step real from A companies in Semarang Regency that are committed and supportive policy government to improvement energy new and updated in the form of planning Solar Power Plant (PLTS) with on-grid system. Regulation related to rooftop PLTS already There is since in 2018, namely Regulation of the Minister of Energy and Natural Resources Mineral Resources Law Number 49 of 2018 concerning Use System Rooftop Solar Power Plant by Consumers of PT Perusahaan Listrik Negara (Persero) (Ministry of Energy and Mineral Resources, 2018). In regulation This informed use generator electricity power solar (PLTS) on the roof which is called rooftop PLTS is For reduce cost usage or bill payment PLN consumer electricity. Regulations This experienced several times change, changes final that is Regulation of the Minister of Energy and Natural Resources Mineral Resources Number 16 of 2019 (Ministry of Energy and Mineral Resources, 2019b). 2022, published Regulation of the Minister of Energy and Natural Resources Mineral Resources on the new PLTS that replaces regulation in 2018, namely Regulation of the Minister of Energy and Natural Resources Mineral Resources Law Number 26 of 2021 concerning Rooftop Solar Power Plant Connected to the

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Power Grid Holder Electricity Supply Business License for Interest General (Ministry of Energy and Mineral Resources, 2021).

However, the regulations new This Not yet applied and will be done revision in 2023 with substance main change The PLTS regulation covers export PLTS capacity electricity, cost capacity, and provisions transition, according to information from the website of the Ministry of Energy and Natural Resources Mineral Power Capacity of PLTS using planned on-grid system will installed is below 324 Kwp. Capacity the chosen with consideration on rooftop PLTS permit more easy obtained. According to Regulation of the Minister of Energy and Natural Resources Mineral Resources Law Number 12 of 2019 concerning Capacity Power Plant for Interest Self Executed Based on Permission Operations, Article 3 Paragraph 1, states that business provision power electricity For interest Alone with a total capacity of generator power electricity until with 324 Kwp (Three Hundred and Two Ten Four Kilowatt Power) in 1 (one) system installation power electricity: a. no required permission operations; and b. mandatory convey report 1 (one) time to the Minister via Director General or governor in accordance with authority before do business provision power electricity For interest itself (Ministry of Energy and Mineral Resources, 2019a).

B. LITERATURE REVIEW

Solar Power Plant

According to book (Handbook, 2013), understanding Solar Power Plant is "*Converting sunlight into electricity; Transform light from the sun directly into electricity without any moving parts* "

Types of Solar Panels According to Journal (Purwoto, Jatmiko, F, & Huda),
Monocrystal (Mono-crystalline), It is the most efficient panel produced. with technology latest & productive Power electricity unity the highest area. Monocrystal designed For use that requires consumption electricity large in places with a temperate climate extreme. Own efficiency until with 15%. Weakness from the type panel This is less than optimal in places that have light less sun. efficiency will decrease when weather cloudy.
Polikristal (Poly-Crystalline), Solar panels This fabricated with the casting process. Polycrystal need more surface big For produce Power the same electricity. This panel own higher price low than monocrystal Because its efficiency is also low.
Thin Film Photovoltaic, Solar panels type This is a panel with two layer structure that is microcrystalline silicon and amorphous which have an efficiency of 8.5% and require more surface wide so that the power produced is also greater big than monocrystal & polycrystal. Innovation latest is Thin Film Triple Junction Photovoltaic (with three layer) can functioning very efficient in very air cloudy and can produce Power electricity up to 45% more tall from the type panel other.

Operating Cost / Operating Expenditure

According to (Ruswandi, Jhoansyah, & Sunarya, 2020) Operating Cost / Operating Expenditure / Cost operation is associated costs with operational company that covers cost selling and administrative expenses, marketing expenses (advertising expenses), marketing costs (selling and administrative depreciation and amortization expense, as well as repairs and maintenance expense.

Depreciation / Depreciation

Depreciation or Depreciation is allocation in a way periodic and systematic from price acquisition of assets during period different that get from use of the asset concerned (Sari, 2018). Depreciation confess that asset the lost mark along the walk time consequence wear, tear, or decline technology.

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Objective Depreciation. Allocation Cost: Share cost asset still to in periods accountancy over its useful life, so reflect use asset the in produce income. Book Value Reflection: Shows mark more books accurate from asset stick to the report finance.Planning Tax: Depreciation can used For planning tax, because cost depreciation usually can reduced from income hit tax.

Method Straight Line Depreciation, According to (Sihombing, 2016), Depreciation straight line method is depreciation of assets where mark depreciation or decline consistent every the year and its burden No influenced by efficiency and change productivity.

Payback Period, Payback period is a technique for determining investment with consider time required A investment the For Can full return on investment (Ermawati & Handayani, 2021). Steps-Steps determine the payback period as following: Identification investment beginning: Determine the total amount of funds invested at the beginning. Estimate annual cash flow: Calculate or estimate amount net cash flow generated by investments every year. Count accumulation cash flow: Add up net cash flow every year until the amount The same with or more big from investment beginning. Determine the payback period: The payback period is amount years required until accumulation net cash flow equivalent with investment beginning.

Constitution Energy Renewable, According to law law no. 30 of 2007 article 1 point 6 which explains that source energy renewable is source energy produced from source power sustainable energy if forgotten with good, among other things hot earth, wind, bioenergy, rays sun, water and waterfalls .(Indonesia, 2007)

C. RESEARCH METHODOLOGY

Installation of Solar Panels at PT. ABC uses an on-grid system where procurement of main equipment such as PV Modules, Inverters, Mounting and DC Cables including within the scope of work contractor main. Research This For calculating investment payback period and efficiency cost electricity (Operating Expenditure).

Following are the steps that will be taken done:Technical data collection : Solar Panel Specifications: Efficiency, capacity power (Wp), age use. System Support: Inverter, System storage Battery and Cost installation.

Financial data collection: Initial Investment Costs, Cost For maintenance and repair

External data collection: Electricity rates, there any potential subsidy from government, Intensity radiation sun at location installation

D. RESULTS AND DISCUSSION

Technical Data: Capacity PLTS plan : 324 Kwp, Contract period : 20 years, capacity in year-1 : 97.5%, PV degradation: 0.5%.

Condition Existing : Power installed : 1817 KVA, Usage Kwh Electricity : 718,944 / month

Financial Data: Investment value: Rp. 3,140,833,800, PV Maintenance Cost: Rp. 5,494,500, Cost Module Replacement: Rp. 7,154,164 / 3 panels / year, Inverter Replacement : Rp. 361,094,210 / 10 years, Cost Insurance : Rp. 15,704,169 / year.

External Data: Electricity rate : Rp. 1081,255, Rate Increase : 5% / year, Subsidy Government : Rp. 0, Net Sun Hours : 3.03 hours / day, Inflation : 3%, Interest : 8%

Payback Period is one of the the method used in analysis investment For determine how much fast investment beginning can returned from cash inflow generated by a project. Method This very popular Because its simplicity and its capabilities For give description about associated risks with time return investment. Payback period is calculated with calculation as following:

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Table 1 Payback period calculation

Year	1	2	3	4	5
Index	97,50	97,00	96,50	96,00	95,50
Energy	349.370	347.578	345.787	343.995	342.203
Tariff	1.036	1.088	1.143	1.200	1.260
Revenue	361.947.320	378.165.255	395.099.375	412.780.718	431.241.632
COGS (O&M+PV Module Replacement)	12.648.664	13.028.124	13.418.968	13.821.537	14.236.183
COGS (Inverter)					
COGS (Tools O&M)					
COGS (Biaya Pembongkaran) - Optional					
Insurance Cost	15.704.169	15.704.169	15.704.169	15.704.169	15.704.169
Depreciation	274.143.764	274.143.764	274.143.764	274.143.764	274.143.764
Total OPEX	302.496.597	302.876.057	303.266.901	303.669.470	304.084.116
Gross Profit	59.450.723	75.289.198	91.832.474	109.111.248	127.157.516
Tax					
Net Profit	59.450.723	75.289.198	91.832.474	109.111.248	127.157.516
EBITDA	335.517.217	349.282.728	365.746.678	382.939.344	400.892.283
Investating Cashflow	3.140.833.800				
Project Cashflow	- 2.805.316.583	349.282.728	365.746.678	382.939.344	400.892.283
Payback Period	- 2.805.316.583	- 2.456.033.855	- 2.090.287.177	- 1.707.347.833	- 1.306.455.550

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Year	6	7	8	9	10	11
Index	95,00	94,50	94,00	93,50	93,00	92,50
Energy	340.412	338.620	336.829	335.037	333.245	331.454
Tariff	1.323	1.390	1.460	1.533	1.610	1.691
Revenue	450.515.829	470.638.442	491.646.082	513.576.898	536.470.639	560.368.716
COGS (O&M+PV Module Replacement)	14.663.269	15.103.167	15.556.262	16.022.950	16.503.639	16.998.748
COGS (Inverter)					361.094.210	
COGS (Tools O&M)						
COGS (Biaya Pembongkaran) - Optional						
Insurance Cost	15.704.169	15.704.169	15.704.169	15.704.169	15.704.169	15.704.169
Depreciation	274.143.764	274.143.764	274.143.764	274.143.764	274.143.764	274.143.764
Total OPEX	304.511.202	304.951.100	305.404.195	305.870.883	667.445.782	306.846.681
Gross Profit	146.004.627	165.687.342	186.241.887	207.706.015	- 130.975.143	253.522.035
Tax						
Net Profit	146.004.627	165.687.342	186.241.887	207.706.015	- 130.975.143	253.522.035
EBITDA	419.638.377	439.211.896	459.648.544	480.985.526	142.167.392	526.517.152
Investating Cashflow						
Project Cashflow	419.638.377	439.211.896	459.648.544	480.985.526	142.167.392	526.517.152
Payback Period	- 886.817.173	- 447.605.277	12.043.267	493.028.793	635.196.185	1.161.713.337

Evaluation	
NPV	- 153.928.864
PIRR	6,70%

In the table above, can seen from column 8th year item payback period shows mark positive which is Rp. 12,043,267 which means solar panel investment be at the point come back investment or also called break even point. In the column the 10th year there is Operating & maintenance value Rp. 361,094,210 for inverter replacement which means age use inverter for solar panels is 10 years.

Bar chart this annual (barchart) describes the accumulation process cash inflow from investment during a number of years, and show the point at which investment beginning succeed returned fully, which is known as Payback Period.

The following is a bar chart for the payback period of solar panel investment:

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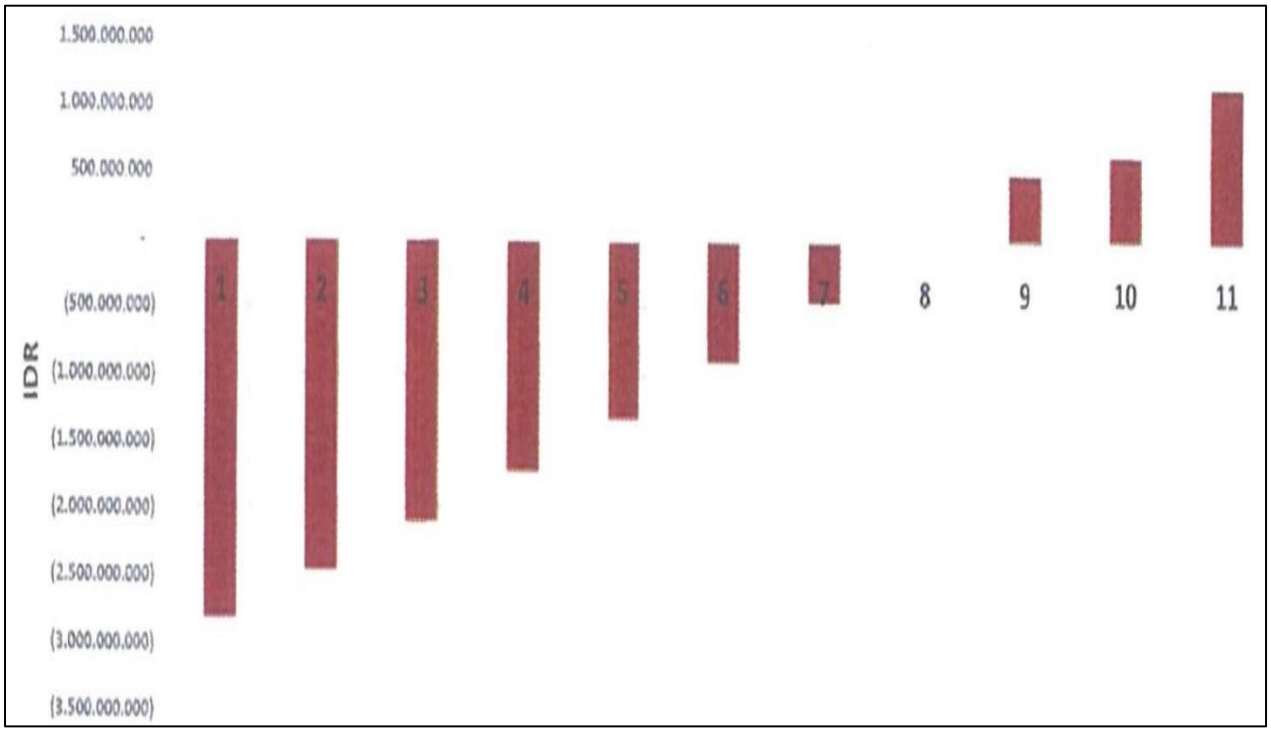

Figure 1 Bar chart payback period

The index listed in table 1.1 is solar panel capacity per year Where decline / degradation pv module assumed decreased by 0.5% every the year.

Revenue calculation is calculated as following: Revenue = Energy x Electricity rate. Where are the rates PLN electricity is assumed to increase every the year as much as 5%.

Operating Expenditure is the total of Cost solar panel maintenance, Cost Insurance and Depreciation asset value.

In the calculation above, the payback period is obtained in the 8th year with PIRR (Internal Rate of Return Profitability) value is at 6.7% where if the PIRR calculation is > 1% then project the profitable in cash flow.

E. CONCLUSIONS AND SUGGESTIONS

From the results study said Author can take conclusion as following: In the Solar Panel Investment at PT. ABC it is assessed give positive impact on the company's cash flow. This is reinforced with payback period calculation in the 8th year. With investment worth Rp. 3,140,833,800 can lower cost Operational as much as Rp. 30,115,000 each the month. Calculations in research This with assuming net sun hours for 3 hours / day, but solar panels will more effective its use in season drought where net sun hours can be at 5 hours / day. Cost maintenance can minimized with method solar panel maintenance in a way Periodically. Cleaning the surface of the solar panel and ensure No There is dirt that sticks every the day can help guard panel durability. Doing checking periodic to cables and installation systems are also very it is important that the cable No corrosion.

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Companies – companies especially those working in the field production can apply energy renewable in the form of solar panels as alternative savings cost electricity. Here are some suggestions from writer in Application of solar panels: Determination Types and materials of solar panels very influential to mark investment and panel durability. Before using solar panels , it is required studies feasibility and study resilience solar panel installation . Solar panels have various impact positive among them can reduce emission carbon and savings cost energy electricity Long term. Solar panels also have lack that is cost installation a good start high and very weather dependency Because need ray sun For optimize function of solar panels. And has age use around 25-30 years, after that panel needs to be replaced and recycled repeat that can cause challenge environment If No managed with Good.

REFERENCES

Handbook, S.E. (2013). *Photovoltaic Fundamentals And Applications.* Pearson Learning Solutions.

Ermawati, N., & Handayani, Rt (2021). *Financial Management And Investment.* (Ar Rahayu, Ed.) Kudus, Central Java: Publishing Agency Of Muria Kudus University.

Asri Jaya, Sm (2023). *Financial Management.* (Sa Dr. Fachrurazi, Ed.) Padang, West Sumatra: Pt. Global Executive Technology.

Sari, Di (2018, April 1). Analysis Of Fixed Asset Depreciation Using Straight Line Method And Sum Of Years' Digits Of Pt. Adira Dinamika. *Monetary Journal, V* , 86.

Indonesia, Uu (2007). Law Of The Republic Of Indonesia No. 30 Of 2007 Concerning Energy. *Republic Of Indonesia* . Indonesia: Republic Of Indonesia.

Purwoto, Bh, Jatmiko, F, Ma, & Huda, If (Nd). Efficiency Of Solar Panels Usage As Alternative Energy Source. *Journal Of Electrical Engineering, 18 No 1* , 11.

Sihombing, Mf (2016, June 2). Analysis Of The Application Of Fixed Assets Depreciation Method And Its Implications On Company Profit At Pt. Manado Persada Madani. *Emba Journal, 4* , 634.

Ruswandi, Rm, Jhoansyah, D., & Sunarya, E. (2020). Analysis Of Capital Expenditure And Operating Cost On Investment Decisions. *Scientific Journal Of Economics Students, 3* , 40 .