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Reducing CO2 by Investing Solar Panel to Support Green Industry and Increasing Competitiveness Manufacturing Industry in Indonesia

Yugo Prasetyo[1*], Selly Nissa Saputri [2]

[123]*Institut Teknologi Sepuluh Nopember, Surabaya, Indonesia*
**Corresponding author: yugoprasetyo84@gmail.com[1*], sellynissasaputri@gmail.com[2*]*

Abstract

Carbon dioxide emission (CO_2) is one of the causes of climate change and global warming that affects air quality and threatens all creature's lives. ASEAN countries have a big impact and Indonesia, as one of the ASEAN members, has a big contribution in increasing CO_2 emission compared to other members, especially in the manufacturing industry sector. Indonesia has adapted the Green Industry and the Government supports renewable energy development and gives incentives such as tax allowance, tax holiday for large investment spur industrialization in Indonesia. Using solar panels is a manufacturer's strategy to fulfill demands and reduce the CO_2 emission as targeted by the Government. This study is to examine the feasibility of the investment of solar panels to transform and adapt with climate change and to contribute to reducing the CO_2 emission, increasing competitiveness in the manufacturing sector.

Keywords: CO_2, competitiveness manufacturer, renewable energy, solar panel

INTRODUCTION

There has been significant growth in both industrial economics and population over a few decades causing some environmental problems that can affect all creature's lives. The industry globally has a big contribution to Carbon dioxide (CO_2) emission and is known as gasses caused by global warming and climate change. ASEAN creates ASEAN State of Climate Change Report (ASCCR) to overall outlook climate change and global warming issues in ASEAN region including recommendation, adaptation, mitigation and considering ASEAN's development context and goal of Paris Agreement (legally binding international treaty on climate change) to limit global average temperature increase below 2 degree Celsius, preferably to 1.5 degree Celsius, compared to pre-industrial levels.

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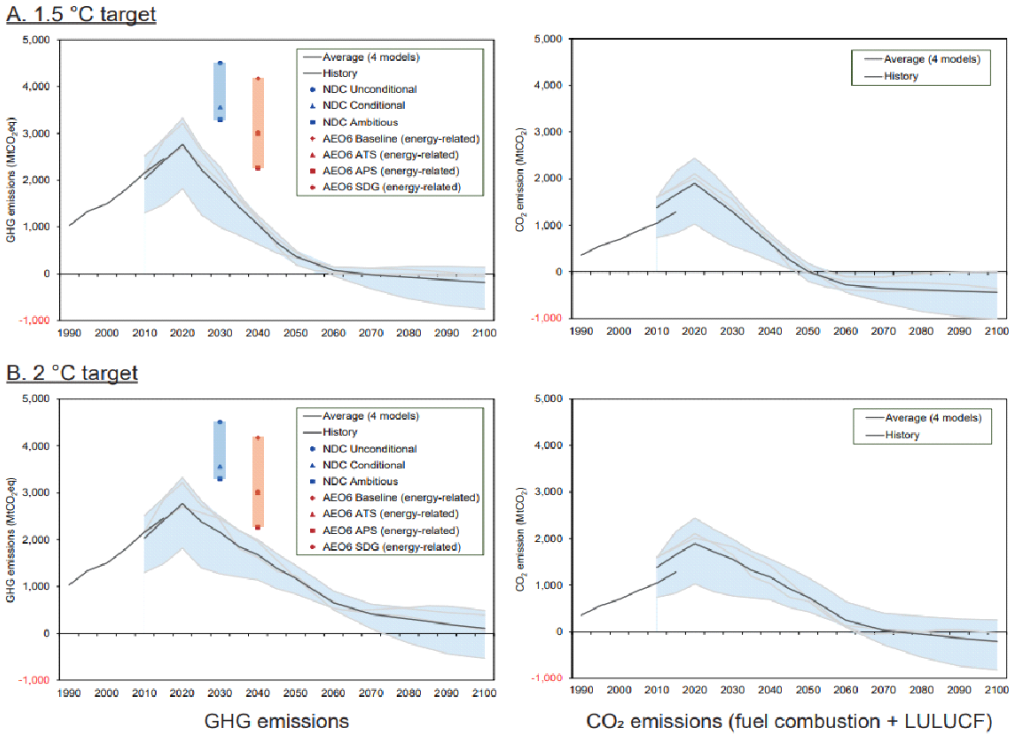

Figure . 1 Historical and future GHG and CO2 emissions pathways in ASEAN to meet the 1.5°C and 2°C targets on a global scale. CO2 emissions include emissions from fuel combustion, industrial processes, and LULUCF. Four models whose simulation results are shown are AIM/CGE 2.1, MESSAGEix-GLOBIOM 1.0, REMIND-MAgPIE 1.7-3.0, and WITCH-GLOBIOM 4.4. The model results for the 1.5°C target assume a scenarios in which national climate, energy and land policies are implemented until 2020 with a transition to a globally cost-effective implementation of a carbon budget for the period 2011–2100 of 400 GtCO2 afterwards, corresponding to a chance of >66% for staying below 1.5°C in 2100. Source: Future emission pathways are from CD-LINKS Scenario Explorer hosted by (IIASA, 2020) and historical emissions are from EC (2019)

Zero carbon solutions are becoming competitive across the economy, including manufacturing representing 25% of emission. The Nationally Determined Contribution's (NDC) target by 2030 could be competitive, representing over 70% of global emission.

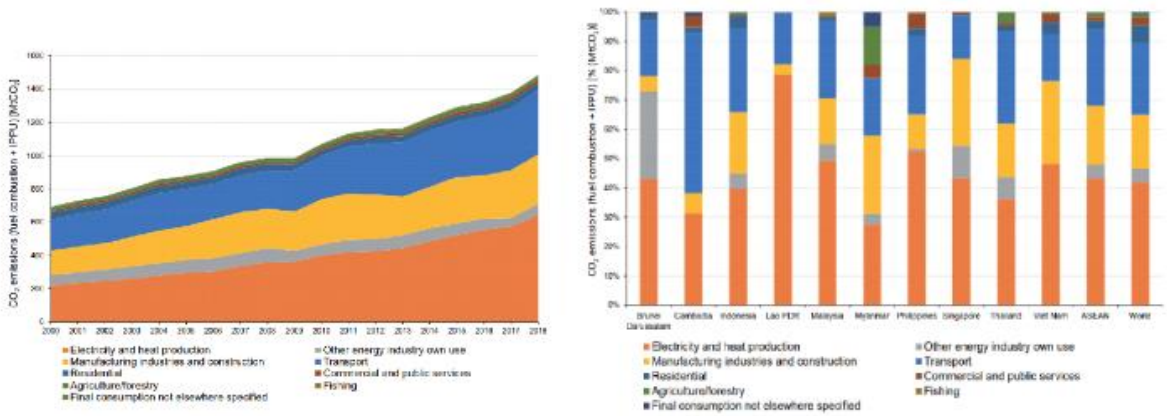

Figure . 2 Sectoral CO2 emissions from fuel combustion in ASEAN since 2000 (left) and country-wise sectoral share of CO2 emissions in 2018 (right). Source: Authors with data from IEA (2020)

Left picture shows the ASEAN CO2 emissions (fuel combustion +IPPU) [MtCO2] from the period 2000 - 2018 and the right picture shows the comparison of CO emission of all member ASEAN countries. The graphic on the left shows increasing CO emission every year and the main contributors are from electricity heat production, and transportation.

Comparison of Renewable Energy (Solar Panel) ASEAN Member and Other ASIA Countries.

Renewable energy can vary such as solar panels, wind turbines etc.

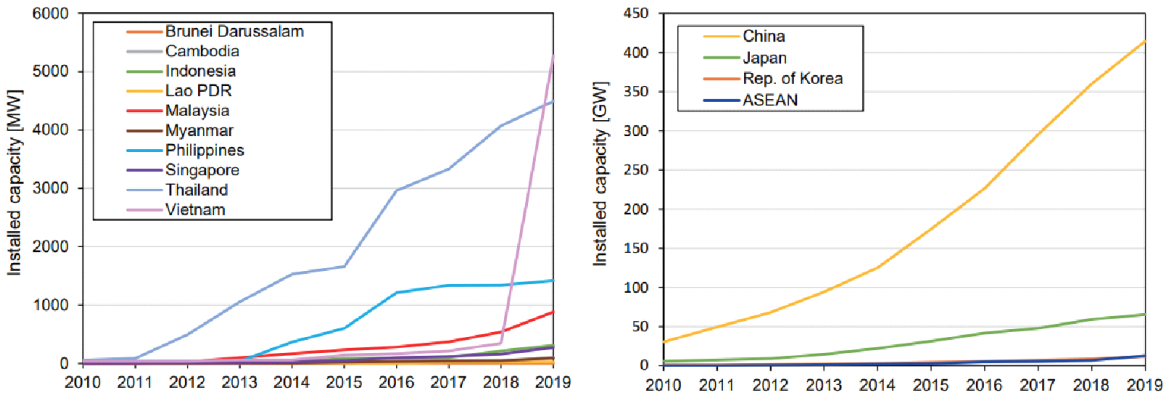

Figure 3. Aggregated renewable (wind and solar) electricity capacity of AMS (left) and ASEAN+3 consisting of China, Republic of Korea and Japan (right) during 2010-2019. Source: IRENA (2021)

Picture above shows that ASEAN countries have significantly used renewable energy since 2010 - 2019. Thailand, the Philippines and Malaysia increased installed capacity of solar panels. Vietnam is most significant and sharply raised using solar panels in 2019 and Indonesia is still far behind. Installed renewable capacity (GW) capacity ASEAN compared to China, Japan and Rep. of Korea, the ASEAN is the lowest capacity. Whether ASEAN or Indonesia has faced the same challenge, the Solar panel can be the solution to reduce the CO2 emission and deliver economic benefit by creating competition specific in the manufacturing industry (improving the product and protecting the environment). Climate action requires significant financial investment by the government and businesses.

Carbon Emission Indonesia manufacturing industry sector amounted to 172MtC02 IN 2014. This makes the industry responsible for 25% of total emission (Government of Indonesia, 2017). Final energy demand has increased by some 43% since 2000, to 57 million toe in 2012. According to RUPTL, power demand in Industry is expected to double between 2016 and 2025 (Indonesia Ministry of Energy and Mineral Resources, 2016). The Government of Indonesia has committed to limit the temperature increase. The Government of Indonesia has developed and implemented an integrated program for reducing gas emission. In the Manufacturing Industry sector, The Ministry of Industry Indonesia keeps pushing the balance between manufacturing growth and environmental sustainability to achieve a green industry. The Ministry of Industry Indonesia hopes the manufacturing sector can transform and contribute to reducing carbon emission to zero emission with two strategies: greening the brown industry and developing the green industry. To speed up the implementation, the Ministry of Indonesia has a priority plan and one of them is efficiency and utilization of renewable energy especially for the solar panels.

Overview Existing Climate Change Policies and Incentives in Indonesia

To achieve Nationally Determined Contribution's (NDC) target, Indonesia Government has adopted Green Industries and keeps pushing sectors including the Industrial sector to use renewable energy, especially Solar panels, to reduce the CO emission. The Industrial Government has several strategies and targets following the Paris Agreement to reduce around 880MtCO2 in 2030. The Climate Action Tracker identified one short-term actionable benchmark for the industry sector to limit warming to 1.5°C at a global level (Kuramochi et al., 2018). The Ministry of Industry (Kemenperin) related climate change (2015-2019) was clustered development of green industries as the main focus. Green Industries defines as industries that ensure effective and efficient use of natural resources to achieve sustainability and provide benefits for.

Table 1. Climate Change Policies in the Industrial Sector in Indonesia

OVERVIEW OF EXISTING, PLANNED AND POTENTIAL CLIMATE CHANGE POLICIES FOR THE INDUSTRY SECTOR IN INDONESIA				
Changing Activity	**Energy efficiency**	**Renewables**	**CCS or fuel switch**	**Non-energy**
Strategy for material efficiency CO2 Emissions Reductions in the Cement Industry (Industrial Minister Regulation No. 12/2012) (2012)	**Support for energy efficiency in industrial production** Ministerial Regulation 14/2012 concerning Energy Management (2012)	**Support schemes for renewables** Biofuel Blending (Ministry Regulation No. 25/2013) (2013)	**CCS support scheme** (none)	**Landfill methane reduction** (none)
	Energy reporting and audits Ministerial Regulation 14/2012 concerning Energy Management (2012) Presidential regulation 70/2009 concerning Energy Conservation (2009)	**Sustainability standards for biomass use** (none)		**Incentives to reduce CH4 from oil and gas production** (none)
	Minimum energy performance and equipment standards CO2 Emission Reductions in the	**Solar PV Roof** (none)		**Incentives to reduce N2O from industrial processes** (none)
				Incentives to reduce fluorinated gases (none)
Overarching carbon pricing scheme or emissions limit (none)				
Energy and other taxes (none)				
Financial Support Schemes for Sustainable Development (none)				
No fossil fuel subsidies (none)				

The above table shows the recent policies developed by the Indonesian Government. TThe Ministry of Energy is optimistic that renewable energy can grow up to 23% by the end of 2025. The Ministry of Industry has targeted that Industry Solar Panels can reach 90% TKDN in 2025. They prepared the roadmap and planning strategic ways and strengthened by changing Industrial ministry regulation 05 Tahun 2017 for solar energy and Peraturan Menteri No. 54/M-IDN/PER/3/2012 for guidance for local products for building energy infrastructure. Indonesia has various support schemes for renewables, such as feeds in tariff geothermal, small hydropower, solar and bi-energy. These tariffs have recently been revisited in Regulation 12/2017 on Utilization of Renewable Energy for the Provision of Power and subsequence regulation 43/2017. These series regulations provide a new mechanism for stimulation of renewable development, in which the feed-in tariff is determined through negotiation between independent power producers (IPPs) and PLN by benchmarking against the regional average electricity generating cost. This creates uncertainty since these average generation costs have been shown to differ from year to year, mainly reflecting change in generation cost of coal-fired power. For regions where the average regional electricity generation cost higher than the national average, the benchmark price for the feed-in-tariff will be 85% of the regional average cost. When the regional cost is lower or equal to the average national cost, negotiation with PLN takes place to determine a maximum benchmark price. These changes generally see lower tariff being paid to private developers compared to previous scheme and give more bargaining power to PLN, causing some projects to become commercially unviable (Horn & Sidharta, 2017). Tax incentives for renewable energy also offered, through regulation No. 21/PMK.011/2010 on Value Added Taxes and Import Duty Exemption for Renewable Energy Property, which extemp taxable goods imported from developing renewable energy projects from VAT and Import Duty (IEA,2010).

Methods

Here are several strategies that can be carried out by the manufacturing industry in Indonesia. Wisudanto (2020), Do foreign investments and renewable energy consumption affect air quality? case study of ASEAN countries, Journal of Security and Sustainability Issues, 9(3)-pp.1057-1063 did a research be conducted on the correlation between higher consumption of renewable energy supplies will reduce demand for non-renewable energy, thereby reducing CO2 emission levels and improving air quality, is one of the strategies undertaken by the government to encourage of new and renewable energy where one of the energy transitions currently being carried out is the installation of solar panels. The financial aspects and competitive advantages are considered in addition to government regulations. In the financial aspect, there are several schemes offered by several solar panel companies including full investment schemes, lease-purchase schemes and then leases. Of course, every company has different capabilities and strategies, e.g plan for installing solar panels in the steel company, it should be analyzed using NPV, IRR, and payback with full investment schemes and lease-purchase schemes in 10 years, with technical specification.

A. Full Investment Scheme

Full investment in the beginning will be done then depreciation will be reduced every year, while source of funds is obtained from the company's internal / retained earnings. The following are the assumptions and conditions for the initial investment.

1. The generated power is 2.6 MW by using Tier 1 solar panel
2. Total Investment cost is 2.2 M USD
3. Assumption: Roof top solar panel does not require structural reinforcement
4. Includes all licensing fees

5. Maintenance fee is not included, assuming the maintenance fee is 25 K USD/year and 100 K USD/10 year in basic electricity rate for industry based on condition PLN 1360/KWH.
6. Using direct supply from inverter without battery
7. Normal PLN rate: 1114/KWH, assuming an increase of 3% per year

For the first calculation we use the calculation of the Net Present Value NPV with the following calculations:

$$NPV = \sum_{t=1}^{N} \frac{Ct}{(1+i)^t} - C_0$$

Where,
NPV : Net Present Value
C_t : Net cash flow over period
C_0 : Initial investment
R : discount rate
t : investment period

From the calculation above,
NPV = - 41.289 USD.

A negative NPV value indicates that the planned investment can't be profitable. So this investment alternative is not feasible to implement. To strengthen these results, the calculation of the Internal Rate of Return (IRR) can be carried out. IRR is a condition where the income level causes the NPW (Net Present Worth) value to be equal to zero. This can be written into the equation:

From the calculation with the formula above resulting:
IRR = 12.55%
As for the Payback period itself by using
x 1 year

$$NPW = PW_R - PW_E = 0$$

$$\sum_{t}^{N} R_t\left(\frac{P}{F}, i\%, t¿\right) - \sum_{t=0}^{N} E_t\left(\frac{P}{F}, i\%, t\right) = 0¿$$

From the calculation with the formula above resulting:
IRR = 12.55%
As for the Payback period itself by using

$$Payback\ Period = n - \frac{a-b}{c-b} X\ 1\ tahun$$

Where,
n : The last year in which the amount of cash flow still has not covered the initial investment
a : Initial investment amount
b : Total cash flow investment in year n
c : Cumulative amount of cash flows in year n + 1

From the calculation of the formula above, the payback period can be 10.32 years. Following the negative NPV Calculation, IRR is 12.55% and Payback 10.32 Years, so it can be said that this initial investment is not feasible.

B. Lease Purchase Scheme in 10 years

In this scheme, the conditions and assumptions are the same as a full investment, but here we are renting for 10 years where we pay an upfront cost of 9 billion rupiah and for our own monthly payments of 90% of the PLN electricity tariff from the power generated. by solar panels. With the calculation as above, it can be obtained for the calculation of the NPV value = - 83,284 USD, while the IRR value is 12.08% and the payback period is 14.44 Years, so that if we look at the feasibility it is still as not feasible for investment.

Results and Discussion

If we look at the two calculation options above, it will be difficult for companies to transform energy to new and renewable energy unless there are some conditions between them. There are several factors that influence the acceleration of this energy transition, learn from some of the problems and challenges that exist at this time.

1. Rules/regulations of governing that oblige industry

Until now there are still no rules or regulations that require this energy transition to be something that must be done in all sectors, we can also see that the government is currently only making calls and campaigns to make energy transitions, started by several state-owned companies, especially in the energy sector. Meanwhile, the government itself is still making improvements to several regulations that regulate standards, procedures, patterns of cooperation and procedures related to the implementation of solar panels, such as the Regulation of the Minister of Energy and Mineral Resources Number 26 of 2021 concerning PLTS Roofs.

2. Company Policy

The company's policy in this CO2 reduction strategy can be said to be a determining factor if the government's current position is still only providing appeals and campaigns for new and renewable energy. As in several large companies that have concerns about the environment, such as the company we are discussing here, a steel company based in Australia where there is policy stating a strategy to reduce CO2 emissions by 30% until 2026, and several state-owned companies such as Pertamina which also have a target. emission reduction of 81.4 million Tons until 2026 according to information conveyed by the president director of Pertamina Nicke Widyawati at the United Nations high-level conference in Glasgow, Scotland in 2021.

3. There is added value gained from the business

The first added value that we can get is production costs that we can reduce in terms of energy costs. We can see if the investment is feasible. This will certainly have an impact on the price of goods produced. As for the product itself in the future, there will be pressures, especially regarding the green industry, which at this time the government already has guidelines for the preparation of green industry standards (SIH) as stated in the Regulation of the Minister of Industry No. 51/M-IND/PER/6/2015. The Green Industry Standard is a reference for industry players in formulating a consensus regarding raw materials, auxiliary materials, energy, production processes, products, business management, waste management and/or other aspects aimed at a green industry. There are several things, including those related to raw materials, auxiliary materials, energy, production processes, products, business management and waste management.

4. Subsidies or incentives from government

This subsidy or incentive is needed to reduce the financing burden incurred by the company. This is needed because this new and renewable energy technology is still relatively expensive, especially if we look at the investment simulation calculations above. At least there are several incentives issued by the government in the fiscal sector, including:

a. Import facility based on PMK PMK Nomor 21/PMK.010/2010 like PPh 22 for import PPN Import and import duty.
b. Tax Allowance according to PMK 89/PMK.11/2015 in the form of a taxable income reduction scenario.
c. Corporate Income Tax Holiday according to PMK Number 35/PMK.010/2018;
d. KPBU with development fund (PDF)
e. Infrastructure development assistance
f. Construction is free from PPN
g. Interest subsidy
h. Emissions incentive scheme

Referring to the incentive scheme above, it will be able to provide cost relief that will create a stimulus for the industry to transition to new and renewable energy technologies. And if we use we get the following Import facility (2,00%1,50%) *Tax Holiday* (1,09%), PPN construction service (0,07%), KPBU - FS Below to government (0,95%),*Tax allowance* (0,76%) and Emission incentive (3,52%). We can be obtained for the calculation of the NPV value: 80,0444 USD, while the IRR value is 13% and the payback period is 9.5 Years, so that if we look at the feasibility , it becomes feasible for investment.

The above factors are very important to help accelerate this energy transition, as we all know, ease of investment, subsidies, company policies, advantages and also resources are a unit that gives each other positive encouragement. However, in the future the pressure for this change will be even greater both in terms of global pressures, competition, regulations and the environment. so that medium and long term plans are needed to survive and the most important thing is to extend the life of this earth by making energy transitions and reducing carbon quickly and precisely through technology.

Conclusion

Indonesia has a contribution in ASEAN for CO2 emissions but if we look at the opportunity to save the earth, Indonesia has a very large contribution. Of course, this opportunity must be provided by Indonesia to play an active role in reducing CO2 emissions in ASEAN.

While in Indonesia, the manufacturing industry has several considerations when applying renewable energy, it will need high investment. Based on method investment by calculating NPV, IRR and Payback Period by two options i.e Full Investment Scheme, where the NPV -41,289 USD, IRR 12,55% and Payback Period is 10.32 years and Lease Purchase Scheme in 10 Years, where the NPV -83,284 USD, IRR 12,08% and Payback Period is 14.44 years. Neither of the two options are feasible and it can be hard to implement renewable energy for the manufacturing industry. The government's role in regulating through regulations and support schemes renewable such as incentives and financing support programmes is very much needed to accelerate this energy transition and is very helpful for the industry to be able to achieve the target of reducing emissions from the government.

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