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Analysis of Energy Transition Policy in Indonesia

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Abstract
This article aims to identify several aspects of the problem in Indonesian energy supply, describe the energy transition policy as a solution to overcome the problems, and study the energy transition in several other countries, especially in Asia, to be used as an example in formulating the right energy transition policy for this country. This problem is focused on the pattern of energy supply in Indonesia and why the energy transition policy has not been optimal. This study used the theoretical reference from Donald S. Van Meter and Carl E. Van Horn: policy target standards, resources, communication between organizations and strengthening activities, characteristics of implementing agents, and social, economic, and political conditions. The data used are studies in the form of reports, papers, or articles in a mass media news column. To encourage the energy transition policy, it is necessary to have a Renewable Energy Subsidy. The analysis was conducted qualitatively. This study's results show that the People's Representative Council of the Republic of Indonesia needs to finalize the regulations that are being drafted, namely the New and Renewable Energy Bill, which is then translated into the vision of the Ministry of Energy and Mineral Resources into an integrated policy framework to overcome obstacles to the development of Renewable Energy. Renewable energy subsidies are needed to encourage energy transition policy to reduce the electricity bills generated from Renewable Energy technology.

Keywords
Policy; Energy Transition; Renewable Energy

INTRODUCTION

Climate change has become a hot topic in recent years, given its close relation to global warming, a phenomenon that causes greenhouse gas emissions and non-environmentally friendly energy. This topic has become a center of attention at the state and community levels. An energy transition is considered vital because it is believed to be one of the most appropriate solutions among a number of other actions in overcoming the prolonged impact of climate change that can lead to the sustainability of living systems both on earth and in the universe.

The impact of climate change that can generally be felt is the increase in earth's temperature due to the number of greenhouse gas emissions, primarily carbon. The increase in carbon emissions is caused by human activities in various aspects and sectors and is the result of natural events. The energy sector has emitted 35.3 GtCO2e, compared to 1850, which was 0.27 GtCO2e (or 29% of the world's total GHG emissions). GHG emissions from the energy sector of 35.3 GtCO2e were the latest inventory data for 2017, contributing to the total global GHG emissions of 77% (Giwangkara, 2020).

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In 1882, the energy sector became the main contributor to global GHG emissions, with 1.07 GtCO2e. Since that year, the energy sector has begun to dominate the agricultural sector (with emissions of 1.06 GtCO2e) as the most prominent global GHG emission contributor. The energy sector is projected to nearly quadruple by 2030 under BAU conditions. If no efforts are made to change it into a more massive Renewable Energy (after this referred to as RE), in less than a decade, the energy sector will emit 1.67GtCO2e. For this reason, the RE sector is the mainstay in reducing Indonesia's GHG emissions. In 2030, the target for reducing GHG emissions from the energy sector is targeted between 11% (or equivalent to 314 MtCO2e) to 14% (or equivalent to 398 MtCO2e) from the target of 29% and 31%, respectively (Giwangkara, 2020).

RE is crucial in the energy transition in the 20th century because it plays a role in tackling the global and local climate crisis in achieving global and local sustainable development goals. Naturally, RE can be replaced or replenished in less time and does not emit GHG during its operation. The elements of renewable energy—solar, water, and wind—are considered the most 'safe' and 'clean' energy sources. Indonesia has a potential RE of 442.4 GW, but up to now, only 2 percent has been utilized. Therefore, optimization is needed to achieve equitable electrification in Indonesia. The formulation of problems in this study covers the problems with the pattern of energy supply in Indonesia and why the energy transition policy in Indonesia has not run optimally. Then, the purpose of this research is to identify several aspects of the problem in Indonesian energy supply, describe the energy transition policy as a solution to overcome the problems, and study the energy transition in several other countries, especially in Asia, to be used as an example in formulating the right energy transition policy for this country.

Energy transitions are often related to various aspects of the energy system and the importance of a country to the matter. At least several things underlie the importance of the energy transition, such as its relation to climate change and the use of RE. The main factors prompting the energy transition in the world (Sovacool, 2016) include the lack of fossil energy. The supply of fossil fuels may not keep up with the demands in the future. It was estimated that global oil production peaked in 2015, natural gas in 2035, and coal production in 2052. Independent analyses have confirmed these oil, natural gas, and coal projections by the world's best geologists, economists, and energy analysts. British Petroleum estimated that in 2014 the ratio of global reserves to oil, natural gas, and coal production was 53.3 years, 55.1 years, and 113 years, respectively (Sovacool, 2016). RE is essential to support the energy transition, considering its crucial position in reaching the Paris Agreement.

Policy implementation needs the support of human resources and non-human resources. According to the theory of Donald S. Van Meter and Carl E. Van Horn (Subarsono, 2005), policy standards and objectives must be clear and measurable so that they can be realized. If they are ambiguous, there will be multiple interpretations, and it is easy to cause conflict between the implementing agents.

In implementing a policy, the relationship between the implementing agents needs to be good since a program requires support and coordination from one agent to another. For this reason, coordination and cooperation between agencies are needed for the success of a program. Characteristics of implementing agents, such as bureaucratic structures,

norms, and relationships within the bureaucracy, will affect the program's implementation. Several variables, including social, political, and economic conditions, can support the success of policy implementation as long as they support the implementation of the energy transition policy in Indonesia.

Research by Hanan Nugroho (2019) tried to dip deeper into an energy transition but failed. Oil dependency can be reduced by increasing the share of coal and natural gas, almost without renewable energy. Renewable energy development faces the challenges of central-regional coordination, geography, technology costs, incentive regulations, and institutional capacity. The target of increasing the share of renewable energy is difficult to achieve. Regarding this matter, State-Owned Enterprises proposed to strengthen the institutional capacity. However, this study has no conclusion on a particular regulation related to renewable energy. Another research is from La Ode Muhammad Abdul Wahid, entitled Analysis of National Energy Policy as a Product of Indonesia's Energy Transition Policy published in the Journal of Energy and Environmental Energy (Enerlink). It discussed the targets of the National Energy Policy or what is known as KEN and how it needs to be revised and expanded to energy conservation goals for users, including potential greenhouse gas mitigation. The KEN debate needs to be more 'bottom-up' and involves the ministry of public works and public housing. The targeting of KEN needs to be supported by various accurate models, and the results are used to prepare the General National Energy Plan. KEN also needs to anticipate the impact of energy policy on human resources needs and investment in the energy sector. This research is different from researchers' as it explains the subsidies to reduce energy transition costs in the electricity sector and formulate a Law on New and Renewable Energy as one of the instruments to accelerate the energy transition in Indonesia.

The following research entitled From Fossil Energy to Renewable Energy: Portraits of Indonesian Oil and Gas Conditions in 2020-2050, written by Agus Eko Setyono and Berkah Fajar Tamtomo, published in the journal of new and renewable energy. This research shows that with the depletion of oil and gas content, policymakers need to consider other energy alternatives to avoid an energy crisis. However, they need to pay attention to the remaining fossil energy. The difference with current research is that Indonesia's renewable energy potential is abundant but not yet regulated by policies that stimulate the energy transition, one of which is subsidies so that people can access renewable energy.

RESEARCH METHOD

This section assesses concepts and theories from literature, such as articles published in various scientific journals. A literature review is used to build concepts or theories that become the basis for studies in research (Sukardi, 2013). These sources serve as a reference for analyzing definitions, concepts, and knowledge of a country, especially Indonesia, regarding the energy transition policy and its consequences on the energy system and its environmental aspects. These findings can be used as recommendations for the Indonesian government and new insights related to energy transition policies to support Indonesia's commitments following the Paris Agreement to achieve at least 23% of the target for RE penetration in the primary energy mix by 2025.

RESULTS AND DISCUSSION

Aspects of Problems in Indonesian Energy Supply and the Elaboration of Energy Transition Policies

One of the problems with energy availability in Indonesia today is the scarcity of fossil energy sources due to its decreasing supply in various regions. It is estimated that oil and natural gas production will no longer exist by 2035, and coal production in 2052. Various independent analyses have confirmed the results of these oil, natural gas, and coal projections by the world's best geologists, economists, and energy analysts. British Petroleum estimated that in 2014 the ratio of global reserves to oil, natural gas, and coal production was 53.3 years, 55.1 years, and 113 years, respectively (Sovacool, 2016).

RE is necessary to support the energy transition considering its crucial position in reaching the Paris Agreement. In addition to the energy crisis, there are other factors enforcing the acceleration of renewable energy transition policy in Indonesia (ATKearney, 2019), including:

a) About 80 percent of emissions come from fossil energy producing global carbon dioxide (CO2). Following the results of the United Nations Climate Change Conference in Paris in 2015 to fight climate change, many countries are revising their power generation mix plans and targets. Indonesia, for instance, will reduce the emissions by 29 percent by 2030 compared to BAU as one of the outputs of the RE mix by 23% in the primary energy mix.
b) Energy security. In order to reduce fossil fuel import dependency, several countries are trying to invest in RE. China, for example, is starting to invest in hydro and solar energy. On the other hand, some countries, such as Poland, have increased the power generation from coal since they have a lot of it. The same thing happened in Indonesia. This situation becomes a barrier to adopting RE technology.
c) Affordability. Cost comparison of generating electricity from renewable energy sources with conventional sources is a significant consideration because it is deemed more expensive than fossil fuels. However, as technology evolves, the RE cost is decreasing yearly. It puts the price of some RE technologies on par with fossil. Although power generation from fossil fuels is still cheaper than RE in many countries, some RE technologies have become commercially competitive, especially if there is a high RE potential in the region.
d) Social and consumer acceptance. Consumer preferences for improving health and quality of life have prompted several countries to turn to RE. For example, in a metropolitan city like New Delhi in India, there is immense social pressure to improve the air quality. There are several reasons why Indonesia needs an energy transition to fulfill its INDC's commitments in the energy sector. The expected reduction under the Counter Measure 1 (CM 1) scenario is 314 MTCO2e (11% total BAU), while CM 2 is 398 MTCO2e (14% total BAU) (Damassa 2015).

If it is correlated with the level of fulfillment of the primary energy mix target in 2025 and 2050 according to the RUEN, then the INDC target should have been met in 2023-2024, where the penetration rate of ET in the primary mix was 19-21%. However, the level of ET in the primary energy mix in 2019 was still at 9.5% (Setjen DEN, 2020), equivalent to the emission reduction value of 67.2%. Therefore, to achieve the emission level according to the INDC, it is necessary to accelerate the development of a more RE-based severe energy system. Although, Indonesia's INDC

Figure 1. Reduction of Greenhouse Gas Emissions in 2015-2050.

target still has several questions regarding the target size and the method of achievement and calculation (Damassa, 2015). However, this INDC target has become the standard for the current emission reduction target (Damassa, 2015).

Indonesia has the potential to become a full importer of petroleum in the next 1 decade and to become a full importer of natural gas in the next 3 decades. The level of oil and gas imports has become the most significant burden on the trade balance deficit in Indonesia. Hence, an alternative is needed to prevent Indonesia from becoming a country that completely imports non-renewable energy needs by seeking the use of renewable energy.

Limited fossil reserves make Indonesia unable to risk its long-term energy security. As of October 2020, new oil reserves are around 3.77 billion barrels; if no new reserves are discovered, they can only meet consumption needs within nine years. The current natural gas reserves of 77.3 trillion cubic feet are estimated to run out in 22 years, and coal reserves are around 37.6 trillion billion tons and are estimated to run out within 65 years. Hence, a transition of energy from fossil to new and renewable energy or NRE is necessary. RE potential is more than 400 GW, but of the total potential, only 2.5 percent or 10 gigawatts are utilized (Rosana, 2020). The RE potential recorded in the MEMR until 2015 (RUEN, 2017) can be seen in the Table 1.

The State Electricity Company's debt burden in 2015-2019 continued to increase, especially with the COVID-19 pandemic in 2020. The debt mainly came from the significant investment that the company must spend in the 35 GW electricity development program, most of which was for constructing coal-fired power plants. Meanwhile, the company's debt has grown by an average of 15.6% per year since 2015. The debt-to-equity ratio has been around 50%-70% for the last five years (Hamdi, 2020).

In addition, if the energy transition runs well, fossil-powered power plants have the potential to become stranded assets. If the economic period of the power plant has not ended, then the stranded assets will become an additional debt burden for the State Electricity Company, which is also not small.

Table 1. Comparison of Realization and Potential Utilization of RE in Indonesia

Renewable Energy	Installed Capacity in 2019	Potential	% Utilization
Hydro	5.558,52	75.091	7,40%
Mini and Micro Hydro	417,50	19.385	2,15%
Wind	154,31	60.647	0,25%
Bioenergy	1.889,81	32.654	5,79%
Geothermal	2.130,70	29.544	7,21%
Solar	149,39	207.898	0,07%
Ocean	0	17.989	0,00%

Source: processed from data (Setjen DEN, 2020).

The SDGs program, which has been adopted by a number of countries, especially in support of the Paris Agreement, encourages a low-carbon development pattern that can open more job vacancies related to the management of low-carbon development in all sectors and reduce employment in high-carbon fields, such as fossil energy sector. The world's financial institutions have also begun to impose restrictions or withdraw their support from carbon-emission-laden projects. To be able to seize these opportunities and anticipate the shift in sources of state income from fossil-based energy to clean or renewable energy, it is necessary to anticipate the government's efforts to take more seriously the balance of economic, social, and environmental in the energy transition process in Indonesia. Indonesia has to start obtaining a learning curve from the implementation of RE to ensure economic, social, and environmental stability and resilience in various sectors, especially the energy sector.

The Sejuta Surya Atap Initiative (GNSSA), which was declared on September 13, 2017, by the Ministry of Energy and Mineral Resources and other stakeholders, aspires to increase the use of rooftop solar panels in residential, commercial, public, and government buildings and industrial complexes to achieve the Gigawatt (GW) target before 2020. However, this well-meaning goal also seems complicated to achieve despite some positive developments this year, given the current adoption of rooftop solar PV of only 16.66 MW. It is predicted that the 23% of RE mix target in the primary energy mix in 2025 will not be achieved if the RE development efforts are not massively promoted. This can be seen from the following facts (IESR, 2019): The National Medium-Term Development Plan (RPJMN) targets an RE capacity of 17 GW and the share of RE in the primary energy mix in 2019 at 16%. Meanwhile, in the National Energy Plan (RUEN), the government targets an increase in ET capacity to 13.9 GW in 2019, or 17.5% of the total capacity that year. With the current ET capacity of 10.17 GW, this year's RPJMN and RUEN targets cannot be achieved.

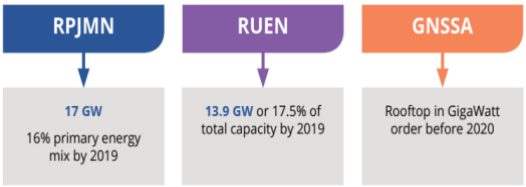

Figure 2. Indonesia failed to achieve its RE development target in 2019 (IESR, 2019).

The main goal of the energy transition is for countries to switch from fossil energy with a higher risk of environmental pollution affecting social security from a health aspect to energy with a relatively

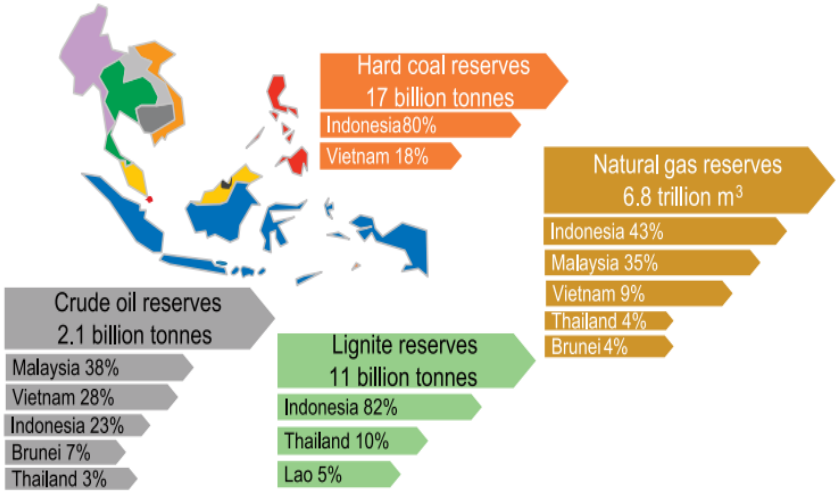

Figure 3. Indonesia failed to achieve its RE development target in 2013 (ACE, 2015)

lower environmental impact or RE. Although ER can be considered a new energy group, the goal of the energy transition is to move from less clean energy to cleaner one. New energy preferred by Indonesia is energy diversification, most of which comes from fossil energy which, although believed to have lower emission levels, is still at a higher level than RE.

According to Law Number 30 of 2007 concerning Energy, what is meant by new energy is one that comes from new energy sources that new technologies can produce, both from RE sources and non-RE sources, including nuclear, hydrogen, coal bed methane, liquified coal and gasified coal. However, the mentioned Law provides mandates to the government regarding RE, such as:

a) The energy provided by the Government or local governments is prioritized for undeveloped areas, remote areas, and rural areas by using local energy sources, especially RE sources. The government needs to increase the amount of energy provided by following their respective authorities;
b) Research and development, as referred to in paragraph (I), is directed primarily to the development of new energy and RE to support the development of an independent national energy industry;
c) The development and utilization of research results on new energy and RE are financed from state revenues from non-renewable energy.

Currently, more than three-quarters of ASEAN's primary regional energy production comes from three sources: coal, oil, and natural gas. They are distributed unequally in various ASEAN countries. Indonesia has 80% of coal reserves, while Vietnam has most of the rest (18%). Around 87% of the total natural gas reserves and 90% crude oil are in Indonesia, Vietnam, and Malaysia. For lignite coal, 92% of the total reserves in the region are in Indonesia and Thailand (IRENA, 2017).

Apart from the fact that the consumption of ASEAN countries is still very dependent on fossil energy, awareness starts to arise that the energy transition is fundamental to supporting long-term energy security. It also supports the realization of the Paris Agreement's target commitments. Therefore, in the ASEAN Economic Community (AEC), ASEAN countries agreed to cooperate in encouraging the increase in RE in the primary energy mix of each country.

ASEAN countries commit to creating an ASEAN Economic Community (AEC), a well-connected ASEAN that encourages one another to be an integrated, competitive, and resilient region. To realize this, following the ASEAN Plan of Action for Energy Cooperation (APAEC) 2016-2025, an energy target is set, one of which is meeting energy needs through RE to reach 23% in the primary energy mix (Setjen DEN, 2020). This commitment was declared at the 33rd ASEAN Ministers on Energy Meeting (AMEM) on October 7, 2015, in Kuala Lumpur, Malaysia. Ministers demonstrated their strong commitment to RE by setting the targets to address future energy security challenges, controlling fossil fuel use, and sustainable economic growth (ACE, 2015).

However, in its implementation, each country shows different progress. An enabling environment is needed to encourage an effective energy transition. Among these are regulatory and political commitments. Over the last few years, the main trend has been shifting away from traditional fixed price mechanisms, such as FiT, to more competitive mechanisms, such as tenders.

This was encouraged to address the challenges of integrating intermittent ET power into the network. In 2017, ET energy tenders were held in more than 29 countries. For some developing countries, these tenders have resulted in low prices, which compete with traditional power generation technologies.

Energy Transition in Several Countries in Asia to Formulate an Appropriate Energy Transition Policy for Indonesia

The energy transition policies in Vietnam are very progressive toward using RE. Vietnam has taken significant steps to promote the development of solar and wind RE. Historically, the country's energy mix has been dominated by hydro and gas power. However, due to the negative impact of overdependence on only these two technologies, it was decided to exploit the untapped potential of solar and wind power. For example, in 2017, Vietnam adopted a new FiT scheme to encourage the development of solar and wind power to reduce the country's dependence on hydropower. The rates were 9.35 cents per kWh for solar power and 7.38 cents per wind. The Vietnamese expected the installed capacity to double the government's target of 2 GW by the end of the first semester of 2019 (ATKearney, 2019).

To support that ambitious plan, a joint effort was made by the prime minister, the Ministry of Industry and Trade of Vietnam (MOIT), and Vietnam Electricity (EVN) to make the Revision of the Electric Power Master Plan VII by the prime minister in 2016 aimed at to increase solar power capacity to 850 MW from 8 MW and wind power to 800 MW from 189.2 MW by 2020 (ATKearney, 2019).

In line with this vision, MOIT launched three initiatives in 2017 to promote RE development (ATKearney, 2019): First, EVNs were required to purchase all on-grid solar and wind power for 20 years from inception with conditions for extension; Second, Vietnam launched a standard PPA model for all solar projects; Third, Vietnam launched the FiT scheme which stipulated tariffs of 9.35 cents per kWh and 7.38 cents per kWh respectively for solar and wind power. This rate was much higher than the conventional electricity rate of around 4.8 cents per kWh.

The FiT scheme also stipulated that the EVN would pay the rate following the exchange rate announced by the State Bank of Vietnam to protect the developer from the risk of foreign exchange loss. Other policies were related to tax incentives, no restrictions on foreign participation, and state-funded credit and subsidies for

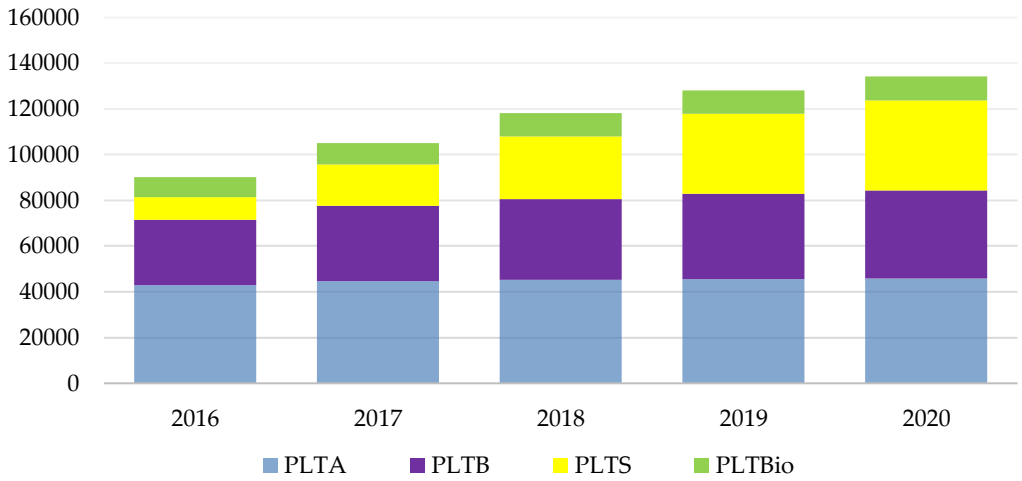

Figure 4. Installed capacity of renewable energy in India 2016-2020 (in MW).

environmental projects to encourage RE development.

Vietnam tried to strike a balance between regulation and flexibility to maximize the value of RE. For example, MOIT deviated several times from the prevailing regulations to address the bankability problem of the developers, which then became a strong positive message to the market. Although Vietnam still faced challenges, such as the problem of PPA bankability and the need for network upgrades, the interest of local companies and banks to invest under these support mechanisms was increasing (ATKearney, 2019).

India's energy transition policy adopted a tender process in recent years, with two rounds of wind energy tenders being held nationwide in 2017, totaling 2 GW contracts, with the lowest bidding under 4 cents per kWh. Then, developed countries followed. Europe, for example, has a tiered system where large projects are awarded through tenders, and small projects are supported by a feed-in tariff policy. India's renewable energy development policy has developed since the oil crisis of the 1980s, which made India (especially the central government) want to reduce its dependence on oil imports and see renewable energy as a solution to increasing national energy security. India has set clear and ambitious renewable energy development targets, 175 GW by 2022 (excluding large-scale hydropower) and 450 GW by 2030. The 175 GW target is dominated by PLTS and PLTB development which reach 100 GW and 60 GW. From the 2022 target of 175 GW, there are already 88.5 GW of installed capacity and about 73.5 GW of projects in the development and tender stages.

The development of renewable energy in India is supported by policies that address risks and problems on the supply side (power generation) and the demand side (consumers and buyers of electricity). From the supply side, the central government has started to encourage the development of renewable energy since the establishment of the National Tariff Policy in 2006, which provides incentives to private investors by providing feed-in-tariffs determined through competitive auctions. In addition, the Indian government is also encouraging renewable energy through the National Solar Mission program, which began in 2010. The program provides certainty to investors through payment security for PLTS projects approved under the program,

Power Purchase Agreement (PPA) contracts, or a long-term Electricity Purchase Agreement (PJBL). Solar Energy Corporation of India Limited (SECI) is the institution appointed to manage the payment security fund.

On the demand side, there is the implementation of a Renewable Purchase Obligation (RPO) which creates a demand for renewable energy. Between 2010-2012, RPO was applied to electricity distribution companies (discoms), owners of power plants for their own needs (captive), and open access electricity consumers. Revisions to the National Tariff Policy in 2016 provide mandatory nationally defined RPO targets and adoption obligations for state governments. This policy is combined with a Renewable Energy Certificate (REC), where the RPO obligations can be met by purchasing the REC.

In particular, the Indian government allows 100% foreign investment (PMA) for renewable energy and the use of imported technology for its renewable energy development. This freedom of investment has encouraged high FDI in India's renewable energy sector and has reached 10.3 billion USD since 2000. At the same time, the central government is encouraging the development of the domestic manufacturing industry through the "Make in India" program and production-linked incentive schemes that provide incentives according to the quality and TKDN of the manufacturing industry in India. The scheme has secured an investment permit for the solar module manufacturing industry of 54.5 GW and will allow India to become a solar module exporter in the next few years.

Eventually, the Indian government is also running important tenders with certain Domestic Component Level (TKDN) requirements introduced along with taxes on imports of renewable energy products. The combination of setting ambitious targets and supporting regulations on the demand and supply side of energy has enabled renewable energy development in India to grow on target. However, it was noted that there are still some obstacles to developing renewable energy in India, mainly the capabilities of different states and the financial condition of discoms, which, even before the policy was implemented, were not in a healthy condition. Renewable energy development can be accelerated if the policies and regulations issued can overcome the risk problems in renewable energy investment to improve the renewable energy investment climate.

From the examples of the two countries, risk factors in renewable energy investment are mitigated through setting ambitious renewable energy development targets, precise regulation of renewable energy tariffs (in the form of reverse auctions, FiT, and payment security), and creating regulations that can encourage market demand for renewable energy. Incentives given to renewable energy, such as non-fiscal incentives (elimination of import duties, tax reductions) and ease of investment process (100% FDI, land), provide better bankability values so that they become additional incentives for investors in making final investment decisions for renewable energy.

CONCLUSION

Renewable energy development can be encouraged in Indonesia if it is supported by some policies and regulations to overcome the risk problems in renewable energy investment. Further, the People's Representative Council needs to include a specific article that regulates renewable energy subsidies and investment licensing in the regulation to increase renewable energy investment. The Ministry of Energy

and Mineral Resources has to finalize the regulations for the RE to have a clear policy framework. From the examples of the two countries, Vietnam and India, some points regarding energy transition policy can be taken; they are: managing risk factors in renewable energy investments are mitigated through setting ambitious renewable energy development targets, precise regulation of renewable energy tariffs (in the form of reverse auctions, FiT, and payment security), and issuance of regulations that can encourage market demand for renewable energy (in the form of RPO, REC, direct PPA); giving incentives to renewable energy such as non-fiscal incentives (elimination of import duties, tax reductions) and easing the investment process (100% FDI, land) to provide better bankability values so that they become additional incentives for investors in making final investment decisions (final investment decision) for renewable energy. There are interesting lessons from Vietnam and India regarding how the Indonesian government can take advantage of the momentum of renewable energy investment to build the capacity of domestic industries. The combination of renewable energy technology programs made in the country and transparent tender arrangements, especially between auctions and TKDN and non-TKDN, is expected to make renewable energy development have a more significant economic impact in the long term.

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