

POSITIONING INDONESIA IN THE INTERNATIONAL WORLD THROUGH ENERGY TRANSFORMATION

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Abstract : Renewable energy (solar energy, wind, ocean, geothermal, bio-energy) is believed to be a “game-changer” in energy relations between countries and completely change the landscape of international relations. Fossil energy – which will soon become extinct – will inevitably be replaced by renewable energy and this energy transition will be an interesting phenomenon from a global geopolitical perspective. Fossil energy-producing countries, especially coal, oil, and natural gas, will be displaced by renewable energy-producing countries where the accompanying characteristics will change established patterns of strategy and cooperation. As a vast archipelagic country with enormous renewable energy potential, Indonesia – along with other major powers such as the United States, Europe, Russia, China, Japan, India, and OPEC countries – should be able to undertake utilization and mitigation strategies in this major transition. The emergence of the global energy game that will lead to a renewable energy regime is a big momentum that will shape the future of energy geopolitics. Is Indonesia in the right direction and strategy in the context of this energy transition? How can Indonesia's energy strategy and policies position Indonesia internationally and make it a "winner" and not a "loser"? This paper will examine the development of renewable energy in Indonesia, Indonesia's position in the international world and its potential as an international actor.

Keyword: international actors, renewable energy, international position, energy transition

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INTRODUCTION

Energy is fundamental and determines the welfare of the nation. Since the industrial revolution, the world's energy needs are inevitable to support industrial development, production, distribution, and economy and are very decisive in the relationship between countries as producers and consumers of energy itself. The industrialization that continues to increase with the use of fossil energy such as oil,

coal, and gas has an unimaginable environmental impact. Global warming with all its implications then becomes a global agenda in regional and international meetings.

The discovery and use of alternative energy that is cleaner and does not damage the earth (clean energy) is a new trend. New and renewable energy is emerging as the energy that is technologically feasible, economically attractive and sustainable and is considered the answer to meeting the energy needs of many countries, companies, and societies. In other words, the energy transition from conventional energy to renewable energy will sooner or later accelerate. Considering that renewable energy will determine the "energy security" and "existence" of a nation, this transition from a geopolitical perspective can be a "lighter" for changing the constellation of power in international relations. Each country will mobilize capabilities and resources towards the development of new and renewable energy by the strength of innovation and various dynamic internal factors such as policy making, investment funds, technological innovation, and social and political conditions.

Leading renewable energy countries such as the United States, China, Germany, Denmark, Norway, Japan, and India have shown accelerated innovation and the spread of use and marketing so that the geopolitical and geo-economics map of renewable energy will change according to developments. Indonesia as a country with a large potential for renewable energy sources needs to position itself and take advantage of the opportunities that are open through energy transformation. To what extent can the transformation "push" be realized? What are the obstacles faced and how did Indonesia overcome them?

The study of Vakulchuk, et.al (2020) shows that the literature on geopolitics and renewable energy even though it had started in the 1970s and 1980s has continued to increase in the last 10 years. Issues that arise related to the global transformation of renewable energy are the increase or decrease in the conflict between countries, the emergence of "winner" or "loser" countries, links to the international system, demand for imported raw materials such as metals, minerals, bauxite-aluminum, cadmium and so on which are needed in the production of renewable energy, development of renewable energy and cyber security.

The dualism of energy use and development (conventional vs. renewable) will continue for some time, but this condition will also be influenced by more and more countries realizing the importance of achieving clean energy targets to avoid the impact of global warming; with ongoing losses: weather anomalies, disease, food security, floods, landslides, droughts. The transition to new and renewable energy is only a matter of time and every country will inevitably have to position itself with these global changes.

In sub-findings and discussions, the author will describe the phenomenon of energy transformation, geopolitical impacts, the development of renewable energy in Indonesia, and Indonesia's position in the international world through the transformation

METHOD

The research was carried out using a qualitative approach. The research subject is the Indonesian government with specifications from the Ministry of Energy and Mineral Resources (ESDM) while the object of research is policies and strategies in responding to global energy transition trends and challenges faced. The study is also analytical because it explains the causal relationship between variables, namely the problems faced in the domestic energy transition and the opportunities to become international actors. Meanwhile, a descriptive approach is used to explain local and global phenomena in the context of energy transformation.

Data was collected through literature studies and interviews with officials from the Directorate of New, Renewable Energy and Conservation of the Ministry of Energy and Mineral Resources and the European Union Ambassadors to Indonesia and Brunei Darussalam. The literature data used are in the form of reports, journal articles, books, daily and weekly newspaper articles as well as research results (Dissertation). In the context of this research, geopolitical phenomena about energy have long been the subject of the author's observation, so that the government finds things that need to be of concern to the government, both in terms of New and Renewable Energy (NRE) development and utilization policies, sustainable development policies and other international aspects. Interviews were conducted to explore the Indonesian government's energy policy and roadmap and whether it will be in line with global trends and Indonesia's international position.

To strengthen the description and analysis of the study, in addition to using qualitative and quantitative data, the author also uses concepts from other disciplines, namely Environmental, Energy, and Economics to help clarify the phenomenon of energy transformation and Indonesia's international position. Thus, it is hoped that an understanding of the phenomenon of energy transformation will not only be understood through the perspective of national economics and politics but also about deployment policies by other countries that will have an impact on Indonesia's geopolitical position.

RESULT AND DISCUSSION

Energy Transformation: Fossil to New Renewable Energy

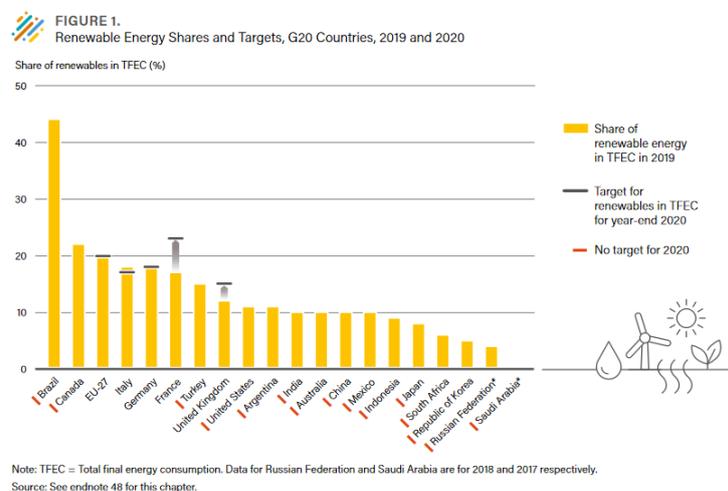
As an essential commodity for the country's development, the need and demand for energy continue to increase. Since the Industrial Revolution in England, the

development of manufacturing, technology, and transportation has moved very fast and energy needs are met by coal, oil, and gas. However, the use of conventional energy was soon realized and would not last long. Massive extraction will deplete the energy sources of coal, oil, gas, and uranium in addition to the impact on the environment in the form of global warming which will destroy the earth. The point is that fossil energy is no longer profitable and even dangerous because it is non-renewable, depends on price fluctuations and the supplying country, and contributes the most to the increase in greenhouse gases. Renewable energy then becomes an alternative because it can always be renewed and will not run out (solar energy, wind, sea, geothermal, bio-energy).

Since the end of the 20th century, renewable energy has attracted attention again and various countries have begun to issue policies, regulations, and mechanisms to support and expand their use. The character that accompanies the development of renewable energy – environmentally friendly, competitive in terms of price, decentralization, and local management – is also believed to change various relations practices between internal state actors and between state actors. The rapid development and expansion of NRE in the long term will have an impact on geopolitical dynamics: power relations, trade, instability, and even conflict (Vakuchuk et.al 2020:3-5, Global Commission on the Geopolitics of Energy Transformation 2019:55).

How far have countries shifted their orientation to NRE development? Globally, even though they are in the COVID-19 pandemic crisis, G-20 member countries still show commitment in the form of NRE contributions (2019) and set NRE targets (2020).

Figure 1. Renewable Energy Contributions and Targets for G-20 Countries, 2019 and 2020

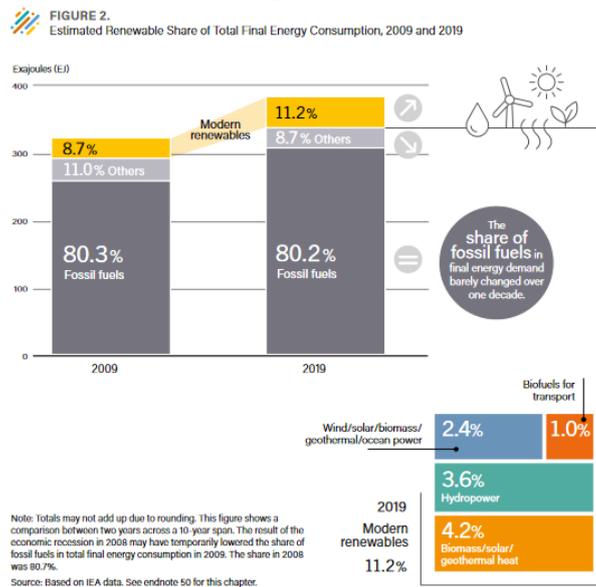


Source: REN21 Renewables 2021 Global Status Report

https://www.ren21.net/wp-content/uploads/2019/05/GSR2021_Full_Report.pdf

Almost all G-20 countries show a contribution although it varies from the highest in Brazil to the lowest such as the Russian Federation (2017) and Saudi Arabia (2018). Five countries consistently set targets for TFEC (Total Final Energy Consumption) 2020, namely EU-27, France, Germany, Italy, and the UK (REN21: 32).

Figure 2. Estimated Contribution of Renewable Energy from Total Final Energy Consumption 2009 and 2019

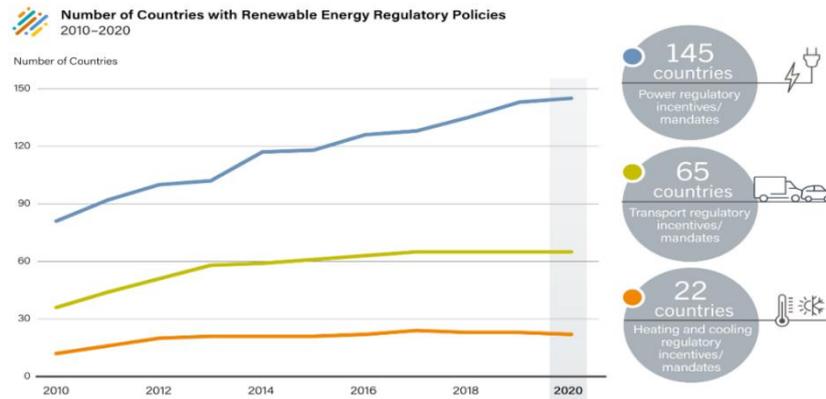


Source: REN21 Renewables 2021 Global Status Report

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REN21 data (Figure 2) shows the contribution of renewable energy from total energy consumption (TFEC) which shows an increase of 2.5% during the 2009-2019 period; although the contribution of fossil energy remains dominant, it slightly decreased from 80.3% to 80.2% in the same period (REN21:33).

If the implementation of NRE is highly dependent on global commitments and national policies, then policy support plays an important role in the adoption and deployment of NRE. Figure 3 shows that state policy support remains strong in 2020, as many as 145 countries have mandates/incentives for electricity regulation, 65 countries have mandates/incentives for transportation regulations and 22 countries have mandates/incentives for heating and cooling regulations. (REN21: 59).

Figure 3. Number of Countries with Renewable Energy Regulatory Policies

Note: Figure does not show all policy types in use. In many cases countries have enacted additional fiscal incentives or public finance mechanisms to support renewable energy. A country is considered to have a policy (and is counted a single time) when it has at least one national or state/provincial-level policy in place. Power policies include feed-in tariffs (FITs) / feed-in premiums, tendering, net metering and renewable portfolio standards. Heating and cooling policies include solar heat obligations, technology-neutral renewable heat obligations and renewable heat FITs. Transport policies include biodiesel obligations/mandates, ethanol obligations/mandates and non-blend mandates.

Source: REN21 Policy Database.

REN21 RENEWABLES 2021 GLOBAL STATUS REPORT

Source: REN21

https://www.ren21.net/gsr-2021/chapters/chapter_02/chapter_02/

State support for the “zero-emission” target will also indirectly affect the development of NRE. Table 1 shows the “zero-emission” and “carbon neutral” targets set by countries/regions (REN21:65) such as EU-27, Austria, Canada, Hungary, Jamaica, Lao PDR, Maldives, Mauritius, Nepal, United Kingdom, the Vatican for “zero-emission” target while Argentina, Barbados, China, Japan, Kazakhstan, Republic of Korea, Malawi, Nauru, Slovenia, South Africa for “carbon neutral” target.

Table 1. “Zero Emission” and “Carbon Neutral” Country/Region 2020 Targets

TABLE 4.
New Net Zero Emission and Carbon-Neutral Targets Set by Countries/Regions in 2020

Net zero emission targets				
Country/region	2019 CO ₂ emissions (kilotonnes)	2019 CO ₂ emissions (% of world total)	Target year	Legal status
EU-27	2,939,069	7.73%	2050	Proposed
Austria	72,363	0.19%	2040 ¹	In law/policy document
Canada	584,846	1.54%	2050	Proposed
Hungary	53,183	0.14%	2050	In law/policy document
Jamaica	7,442	0.02%	2050	Pledge
Lao PDR	6,783	0.02%	2050	Pledge
Maldives	913	<0.001%	2030 ²	Pledge
Mauritius	4,332	0.01%	2070	Pledge
Nepal	15,019	0.04%	2050	NDC
United Kingdom	364,906	0.96%	2050 ³	In law/policy document
The Vatican	N/A	N/A	2050	Pledge

Carbon-neutral targets				
Country/region	2019 CO ₂ emissions (kilotonnes)	2019 CO ₂ emissions (% of world total)	Target year	Legal status
Argentina	199,414	0.52%	2050	NDC
Barbados	3,827	0.01%	2030	In law/policy document ⁴
China	11,535,200	30.34%	2060	Pledge
Japan	1,153,717	3.03%	2050	Pledge
Kazakhstan	277,365	0.73%	2060 ⁵	Pledge
Korea, Republic of	651,870	1.71%	2050	NDC
Malawi	1,616	<0.001%	2050	Pledge
Nauru	N/A	N/A	2050	Pledge
Slovenia	15,365	0.04%	2050	National plan/strategy
South Africa	494,862	1.30%	2050 ⁶	National plan/strategy

Notes: Net zero emissions can refer to all greenhouse gas emissions or only carbon emissions, and involves emissions declining to zero. Carbon neutral refers to the balancing of carbon emissions caused by an entity with funding an equivalent amount of carbon savings elsewhere. Although carbon neutrality is sometimes considered to be a synonym for net zero carbon emissions, carbon neutrality can be achieved at the domestic level by using offsets from other jurisdictions, whereas net zero does not necessarily include this feature. Some of these countries – along with Colombia, Kenya and Peru – also adopted other targets less than carbon-neutral/net zero (see GSR 2021 Data Pack for full dataset).

1 Austria's target is for "climate neutrality".

2 Target to be reached with adequate international support and assistance.

3 Adopted in 2019.

4 Published in 2019.

5 Target could be advanced if the country raises USD 10 billion annually from other nations to help finance the transition.

6 South Africa's target is a net zero carbon emissions target.

N/A = data not available

Source: See GSR 2021 Data Pack.

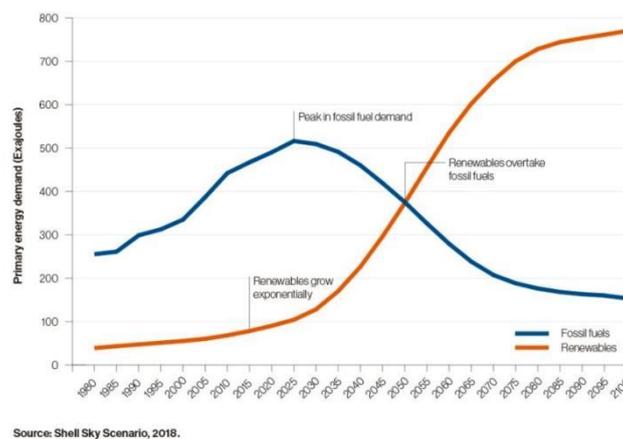
Source: REN 21 Renewables 2021 Global Status Report

https://www.ren21.net/wp-content/uploads/2019/05/GSR2021_Full_Report.pdf

Geopolitical Impact of Energy Transformation

The trend of energy transformation from fossil-based energy to NRE (Figure 4) will certainly change the global energy system and affect almost all countries with broad geopolitical consequences. Geopolitics is interpreted simply as a decisive causal relationship between geography and international relations with a focus on permanent rivalry, territorial expansion, and the military strategy of imperial power (Vakulchuk et.al 2020:2). While renewable energy according to the International Energy Agency (IEA) definition is intended as "energy that comes from natural processes that can renew themselves constantly such as solar, wind, biomass, geothermal, hydropower, oceans (waves, tides), biofuels, electricity, and hydrogen from renewable sources" (IEA 2002). Figure 4 clearly shows the projection of increase tendency of renewable development growth that overtake fossil fuel demand on 2050 with continuous tendency up to 2100 according to Shell Sky Scenario (2018).

Figure 4. Framework for the Transition of Fossil Energy to NRE



Source: Global Commission on the Geopolitics of Energy Transformation 2019:17

Technological advances and the increasingly competitive price of renewable energy against fossil energy have contributed to the acceleration of growth, especially in the electricity sector. Electric vehicles and water heaters (heat pumps) have expanded the use of renewable energy in transportation, industry, and buildings. Digital innovation and energy storage are increasingly driving the potential of NRE to continue to grow. Meanwhile, energy sources, especially solar and wind, are also growing very rapidly. China through the Belt and Road Initiative (BRI) scheme developed the largest "clean energy" wind power project in Central Asia in Kazakhstan with a power of 350 gigawatt-hours per year equivalent to the demand of 1 million households (China Daily 2021:15). A new geopolitical reality has

emerged that is fundamentally different from the conventional energy geopolitics that has been going on for a century.

The new map formed from renewable energy will be marked by a shift in power from fossil-exporting countries to the main NRE developing countries, energy independence will occur because importing countries are no longer dependent on fossil energy supplies, as well as economic development is not at risk of being hampered, fossil energy-exporting countries must adapt while developing coal-using countries must immediately change course. NRE is also believed to have an impact on democracy due to the decentralization of supply, empowerment of civil society, and reducing tension and conflict. The energy transformation landscape will be characterized by energy efficiency, renewable energy growth, and electrification (Global Commission on the Geopolitics of Energy Transformation 2019: 15-16).

According to a study by the Global Geopolitical Commission on Energy Transformation, the rapid transformation of renewable energy is driven by 6 (six) trends, namely (i) decreasing renewable energy prices (ii) pollution and climate change, (iii) renewable energy targets, (iv) technological innovation (v) investor and corporate actions, (vi) public opinion (Global Commission on the Geopolitics of Energy Transformation 2019: 18-23). Meanwhile, the very distinctive character of NRE compared to fossil energy will have different geopolitical consequences. Table 2 shows the characteristics of renewable energy and its impact technically, socially and politically.

Table 2. The Character of Renewable Energy

Renewable energy	Impact
<ul style="list-style-type: none"> ▪ Available in various forms in every country 	Reducing the risk of critical routes in the transportation of global oil supplies
<ul style="list-style-type: none"> ▪ Mostly in the form of "flow" 	No need for stock and storage
<ul style="list-style-type: none"> ▪ Can be deployed at various scales and can be decentralized in terms of production and consumption 	democratization effect
<ul style="list-style-type: none"> ▪ Nearly zero cost, partly like wind, diesel saw a nearly 20% cost reduction in every 2x greater capacity increase. 	Support change but require regulatory solutions to ensure the profitability and stability of the energy sector.

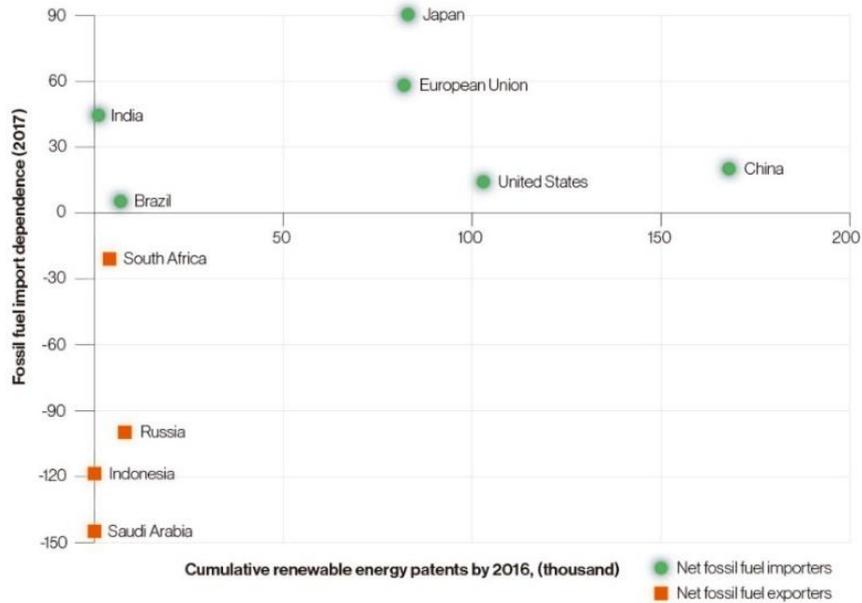
Source: Global Commission on the Geopolitics of Energy Transformation 2019:23

The energy transition impacts differently from fossil-exporting and fossil-importing countries as well as the region. Figure 5 is the impact of the energy transition in several countries and Figure 6 is the regional impact of the energy transition (Global Commission on the Geopolitics of Energy Transformation 2019: 27-29). As shown in Figure 5, countries above the boundary line such as China, the United States, Japan, India, the European Union, and Brazil are the countries that have benefited in the transition period, they are importers of fossil energy but have positioned themselves at the forefront of the NRE development competition.

The Y-axis depicts the share of oil, gas, and coal imports in total primary energy consumption in 2017. It situates selected countries, as well as the European Union, in the energy economy of today, which is dominated by fossil fuels. The higher the share, the more dependent a country is on fossil fuel imports. Net fossil fuel exporting countries have negative shares. The X-axis shows the cumulative number of patents for renewable energy technologies that had been registered by the end of 2016. This indicator provides a way to assess the position of selected countries, and the European Union, in the clean energy race.

From Figure 5 can be observed that The United States is close to energy self-sufficiency, largely due to the shale revolution. It became a net exporter of natural gas in 2017 and is projected to become a net oil exporter early in the 2020s. The US is well positioned in the clean energy race: US companies hold strong positions in new technologies, including robotics, artificial intelligence, and electric vehicles (Global Commission on the Geopolitics of Energy Transformation 2019: 28).

How about China? China will gain from the energy transformation in terms of energy security. It has a leading position in manufacturing, but also in innovation and deployment of renewable energy technologies. It is the biggest location for renewable energy investment, accounting for more than 45% of the global total in 2017. Currently, it remains highly dependent on oil imports which have been growing steadily ((Global Commission on the Geopolitics of Energy Transformation 2019: 28).

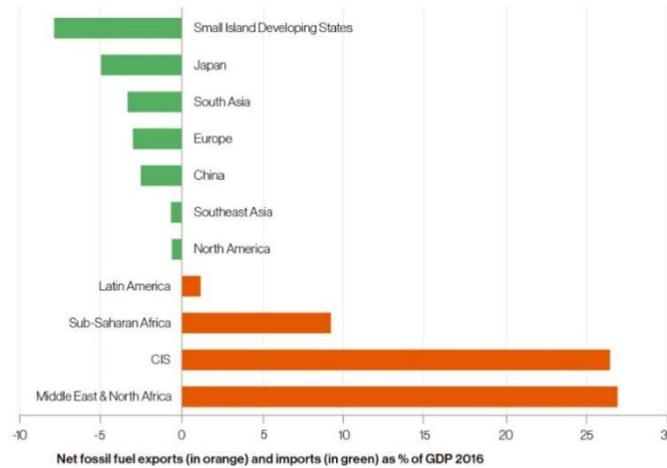
Figure 5. Impact of the Energy Transition on Several Countries

Source: BP, IRENA.

Source: Global Commission on the Geopolitics of Energy Transformation 2019: 27. Meanwhile, Figure 6 shows countries/regions with net fossil exports and 2016 GDP percentage (orange) and net fossil energy importers (green) and 2016 GDP percentage and differences within regional groupings. For instance The Middle East and North Africa, together with Russia and other countries in the Commonwealth of Independent States (CIS), are the regions most exposed to a reduction in fossil fuel revenues. On average, these regions have net fossil fuel exports of more than a quarter of their GDP. Declining export revenues will adversely affect their economic growth prospects and national budgets. To prevent economic disruption, they will need to adapt their economies and reduce their dependence on fossil fuels (Global Commission on the Geopolitics of Energy Transformation 2019: 30).

Otherwise Small Island Developing States (SIDS) will benefit most of all if they adopt renewable energy sources rather than fossil fuels. The import of fossil fuels now amounts to 8% of their GDP. Many SIDS are also extremely vulnerable to the effects of climate change. SIDS possess ample renewable energy sources and renewable technologies can meet most of their domestic energy needs. The shift would cut import bills, promote sustainable development, and increase their resilience. International cooperation to support SIDS' renewable energy ambitions is growing substantially, and 13 SIDS have established 60-100% renewable electricity targets (Global Commission on the Geopolitics of Energy Transformation 2019: 30).

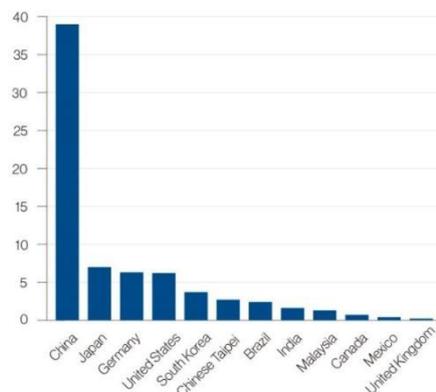
Figure 6. Regional Impacts of the Energy Transition



Source: World Bank, IMF.

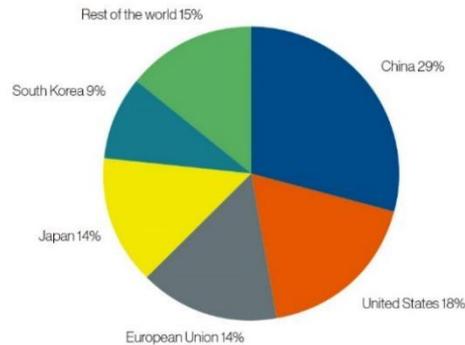
Source: Global Commission on the Geopolitics of Energy Transformation 2019: 29
 The development of renewable energy manufacturing and the acquisition of patents are indicators that cannot be ignored to determine the NRE leader country in the future. A study by the Global Commission on Energy Transformation Geopolitics on Figure 7 shows that China can leverage the development of NRE technology to position its global influence and achievements. Cumulatively (Figure 8), China also collects the highest percentage of patents among its competitors (Japan, Germany, USA, South Korea, Taiwan, Brazil, India, Malaysia, Canada, Mexico, UK). In terms of the percentage of patent acquisition, China is 29%, the US is 18%, the European Union is 14%, Japan is 14%, South Korea is 9%, other countries are 15% (Global Commission on the Geopolitics of Energy Transformation 2019: 41).

Figure 7. Value-Added Manufacturing “Clean Energy” 2014 (US\$ billion)



Source: Clean energy manufacturing analysis center.

Source: Global Commission on the Geopolitics of Energy Transformation 2019: 41

Figure 8. Cumulative Number of Patents 2016

Source: IRENA.

Source: Global Commission on the Geopolitics of Energy Transformation 2019: 41
 Meanwhile, investment in each type of renewable energy can be seen in the following REN21 Report data:

Table 3.

Top Five Countries Annual Investment/Additional Net Capacity/Production 2020 Technologies are arranged based on additional total capacity

Capacity	1	2	3	4	5
Solar PV	China	USA	Vietnam	Japan	Germany
Wind Power	China	AS	Brazil	The Netherland	Spain/Germany
Hydro Power	China	Turkey	Mexico	India	Angola
Geothermal	Turkey	USA	Japan	-	-
Concentration of Solar Thermal	China	-	-	-	-
Solar Water Heater	China	Turkey	India	Brazil	USA
Ethanol	USA	Brazil	China	Canada	India
Biodiesel	Indonesia	Brazil	USA	Germany	France

Source: REN21 Report, p. 41

New Renewable Energy Development in Indonesia

The IEA noted that Indonesia is a country with a population of 267.66 million and a GDP of 999.13 billion USD (2015) and is an oil-importing country that has recently been increasing. Indonesia is also the fourth-largest coal producer in the world and the largest gas supplier in Southeast Asia. Indonesia is listed as a major producer of

biofuels in the world and is continuously trying to increase the development of renewable energy potential. The importance of Indonesia, especially seen from its large population (fourth in the world) and its significant role as a producer and consumer of energy in regional and international markets.

As an archipelagic country, the potential of Indonesia's renewable energy sources is extraordinarily spread across various islands and needs to be taken into account globally. Indonesia has great potential in developing NRE, including 950 Megawatts of wind energy, 11 Gigawatts of solar power, 75 Gigawatts of hydropower, and 32 Megawatts of biomass energy, 32 Megawatts of biofuel, and marine energy potential in the amount of 60 Gigawatts, and geothermal which is estimated to have a potential of 29 Gigawatt ([Jurnal Energi Edisi 2 17112016\(1\).pdf](#)).

However, the utilization of NRE is still not maximized. The Ministry of Energy and Mineral Resources noted, for example, that the mix of energy source utilization as of 2015 was still dominated by fossil energy. Nationally, the use of fossil energy is still the focus of the community at 47%, followed by coal and natural gas with 24% each, the remaining 5% for renewable energy (equivalent to 5 million barrel of oil/year). Meanwhile, oil consumption reached 550 million barrels/year with an average increase of 8% per year.

The New, Renewable Energy and Energy Conservation Policy is under the Ministry of Energy and Mineral Resources which consists of 4 (four) Directorate Generals, namely the Directorate General of Oil and Natural Gas, The Directorate General of Electricity, The Directorate General of Mineral and Coal, and The Directorate General of New, Renewable and Conservation Energy. The Directorate General of New, Renewable and Conservation Energy (EBTK) in charge of (i) Secretariat of the Directorate General of New, Renewable and Conservation Energy (ii) Directorate of Geothermal, (iii) Directorate of Bioenergy, (iv) Directorate of Various New and Renewable Energy, (v) Directorate of Energy Conservation, and (vi) Directorate of Infrastructure Planning and Development.

The vision of the Director-General of EBTK is "Availability of clean energy to meet national energy needs (efficiently) in the context of sustainable development". Meanwhile, the mission to be achieved is (i) Maximizing energy conservation, (ii) Optimizing the supply and prioritizing the use of new and renewable energy in the context of diversification, (iii) Increasing the role of the private sector in large-scale NRE development and community participation in small-scale NRE development (iv) Increase domestic production/local content in support of the development and utilization of EBTK in mission number 1,2,3. ([Jurnal Energi Edisi 2 17112016\(1\).pdf](#)).

To encourage the use of NRE and put a brake on the use of fossil resources, the Government issued Government Regulation Number 79/2014 concerning National

Energy Policy. In the policy, the target for the NRE mix in 2020 is stated at 17 percent, while in 2025, the utilization of NRE is expected to reach 23 percent. With five steps of NRE development, such as (i) adding generating capacity for energy production. In the next few years, the construction of hydroelectric power plants (PLTA) and geothermal power plants (PLTP) will be intensified, (ii) increasing the provision of access to modern energy for isolated areas, especially rural energy development with micro-hydro, solar power, biomass, and biogas, (iii) reducing the cost of fuel subsidies, where substitution of diesel-powered power plant with NRE can reduce subsidies, (iv) and (v) reducing greenhouse gas emissions and massive energy savings.

The achievement of the NRE national mix target according to the 2019 Performance report of the Director-General of EBTK is as follows.

Table 4. Primary Energy Mix (%) – Energy Mix

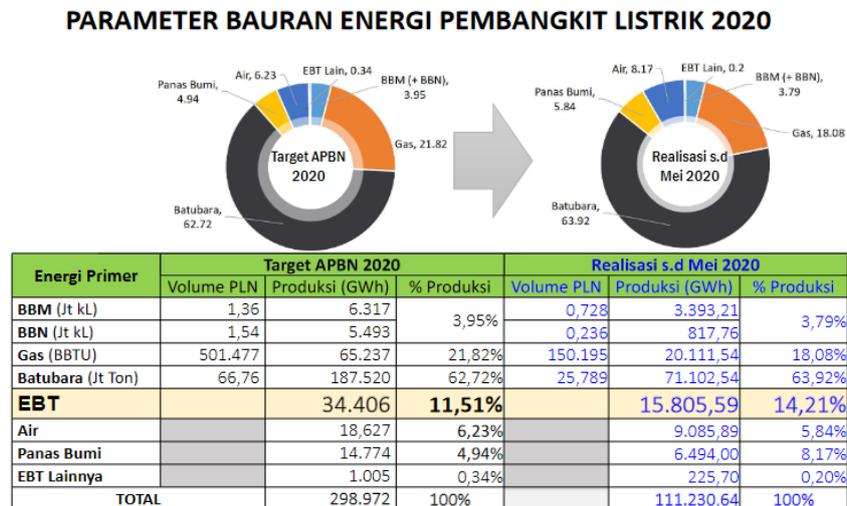
No	Energy Source	2014	2015	2016	2017	2018	2019	2020*
1	NRE	5.33	4.38	6.47	6.34	8.55	9.15	11.51
2	Coal	25.76	27.94	29.85	30.53	32.97	37.15	
3	Oil	47.06	46.57	41.93	42.52	38.81	33.58	
4	Natural Gas	21.85	21.11	21.75	20.61	19.67	20.12	
	Total	100	100	100	100	100	100	

Source: 2019 Performance Report of the Directorate General of EBTKE, page 30*

Data

Table 4 shows the increase in the mix over the last 5 years to 11.51% (2020) where the details of the power plant mix are shown in Figure 9.

Figure 9. Parameters of the 2020 Power Plant Energy Mix



Source: <https://drive.esdm.go.id/wl/?id=QN6BQfH4OEGRlp8FvJ4Fg6BcYToZYecc>

The latest performance of the NRE 2020 sub-sector states that the primary energy mix based on new and renewable energy (NRE) is targeted to increase in 2020 with the addition of a production capacity of 34,406 GWh, of which NRE production from water is targeted to reach 18,627 GWh, geothermal 14,774 GWh, and 1,005 GWh other NRE. As of May 2020, the production capacity of NRE-based power plants has reached 15,805.59 GWh with details of water-based power plants reaching 9,085.89 GWh, geothermal-based power plants reaching 6,494.00 GWh, and other NRE-based power plants reaching 225.70 GWh. (<https://ebtke.esdm.go.id/post/2020/07/28/2593/fact.sheet.update.kinerja.subsektor.ebtke.tahun.2020>).

The 2019 Performance Report also mentions various strategies carried out by the government to increase new ones, including encouraging capacity building for existing NRE power plant units and ensuring NRE projects run according to the Electricity Supply Business Plan (RUPTL), market creation strategies, such as grounding rooftop PV to at the household level; facilitate access to competitive funding, support policies and improve governance in the context of accelerating NRE projects, and mobilize all stakeholders. In addition, other programs developed by the Directorate General of EBTKE include: energy management, energy audits, increasing the number of energy managers and energy auditors, reducing CO₂ emissions, socializing energy-saving, and preparing regulations on energy

conservation. This aims to achieve the RUEN target where savings of 17% must be achieved by 2025.

The government is also developing biofuel energy as an alternative to reducing the use of pure fossil energy with the hope of saving 8% to reduce future fuel needs. The 8% savings are expected to be able to finance NRE development projects in each area based on the natural use of each island such as solar, wind, and micro-hydro energy. NRE development is considered by the government to be very vital in the national energy scenario. National policy drafts must be synergized with regional policy designs and strengthen the energy industry.

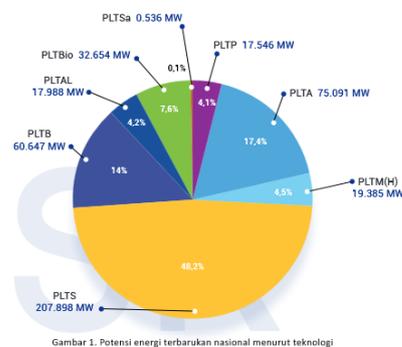
At the regional level, there are 10 provinces (Figure 10) with the largest NRE potential, namely West Kalimantan, Papua, West Java, East Java, East Kalimantan, North Sumatra, West Nusa Tenggara, South Sumatra, Central Kalimantan, Central Java with the following potentials and installed capacities:

Figure 10. Potential of renewable energy in Indonesia

Potensi Energi Terbarukan di Indonesia

10 daerah dengan potensi energi terbarukan terbesar

Provinsi	Potensi (MW)	Kapasitas Terpasang 2018 (MW)
Kalimantan Barat	26.841	247
Papua	26.529	20
Jawa Barat	26.190	3.184
Jawa Timur	24.240	275
Kalimantan Timur	23.841	-
Sumatera Utara	22.478	839
Nusa Tenggara Barat	21.991	17
Sumatera Selatan	21.866	18
Kalimantan Tengah	19.568	-
Jawa Tengah	19.450	366



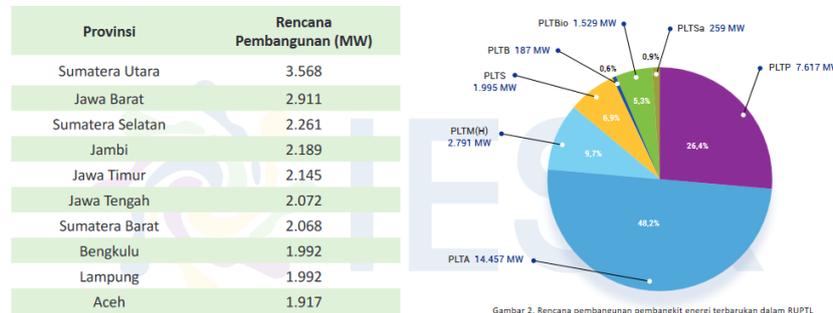
Gambar 1. Potensi energi terbarukan nasional menurut teknologi

Source: ESR (2019). Indonesia Clean Energy Status Report: Potential, Installed Capacity, and Renewable Energy Power Plant Development Plan 2019, page 2
 Apart from Central Kalimantan and Central Java, 8 other provinces have potentials above 20 GW, so that the electricity supply can be adjusted to the local renewable energy potential. However, the planned development of renewable energy plants for 2019-2028 is only in Java and Sumatra (Figure 11): North Sumatra, West Java, South Sumatra, Jambi, East Java, Central Java, West Sumatra, Bengkulu, Lampung, Aceh.

Figure 11. Renewable Energy Plant Development Plan 2019-2028

Rencana Pembangunan Pembangkit Energi Terbarukan

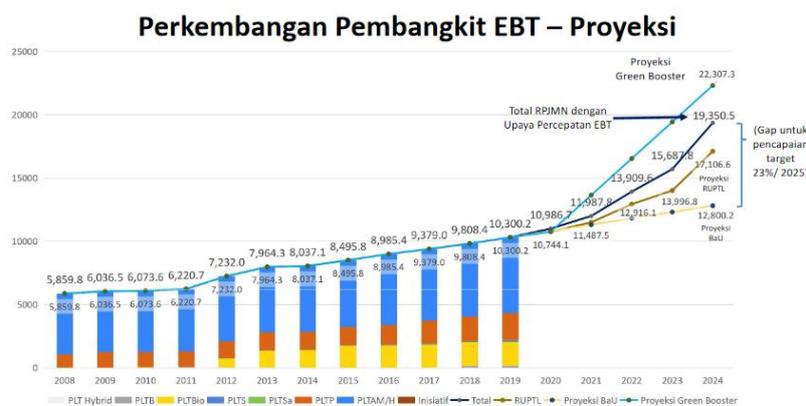
10 daerah dengan rencana pembangunan pembangkit energi terbarukan terbesar menurut RUPTL 2019-2028



Source: ESR (2019). Indonesia's Clean Energy Status Report: Potential, Installed

Capacity, and Renewable Energy Power Plant Development Plan 2019, page 3
 Meanwhile, the NRE development projection data released by the government in 2020 shows an increasing projection. Projection of green booster increases from 10.986.07 (2020) to 22.307,3 (2024) (blue line), total RPJMN (National Middle Term Development Planning) increases from 10.744.1 (2020) to 19.350.5 (2024) (dark blue line), RUPTL/Electricity from 10.744.1 (2020) to 17.106,6 (2024) (brown line) and mix energy from 10.744.2 (2020) to 200.800, 2 (2024) (yellow line).

Figure 12 Projected Development of NRE



Source: <https://drive.esdm.go.id/wl/?id=QN6BQfH4OEGRlp8FvJ4Fg6BcYToZYecc>

Barriers to NRE Development in Indonesia

So far, based on various discussions and experiences of developed countries, the most important and determining factor in the development of NRE is its policy area.

It is believed that government policies will encourage other sectors such as the private sector and society/consumers to move. However, apart from policy factors, capital factors, expertise, and social situation are no less important because these are obstacles found in the field of the development of NRE.

The main challenge is related to the economy calculation of NRE, which is still more expensive than the price of fossil fuel power plants. This is overcome by the plan of a Presidential Regulation related to improving the price of RNE with the consideration that Indonesia's NRE market is still small and has not yet entered the scale of the economy such as solar panel prices are still high, the development of NRE creates new economic values, the purchase price of electricity from NRE does not reflect the economic value that exist reasonable, the need for support from various ministries in optimizing the use of NRE, the need for policy instruments that synergize and synchronize policies, and steps from relevant Ministries and Institutions to support NRE. (<https://ebtke.esdm.go.id/post/2020/07/28/2593/fact.sheet.update.kinerja.subs.ektor.ebtke.tahun.2020>).

Another challenge is the intermittent (unstable) nature of power plants such as Solar and Wind Power Plants which require system readiness to maintain a continuous supply of electricity or vice versa NRE with low cost and good capacities such as Hydro powerplant, Minihydro powerplant, and Geothermal powerplant located in conservation areas which are far from the load center, so it takes longer to build. For bioenergy, biomass and biogas plants require a guaranteed supply (feedstock) during the operation period.

Social factors that require attention and an educational approach are related to community rejection. In several locations where geothermal projects will be built, the community refuses on the grounds of the impacts/risks of geothermal exploration by pointing to the Lapindo case. (<https://katadata.co.id/agustiyanti/ekonomi-hijau/5ec3e93f53436/ganjar-pranowo-masih-ada-warga-takut-pada-proyek-pengembangan-ebt>) both in Central Java, Pandarincang, Banten and other areas. The communication gap occurs because the potential and benefits of NRE are not widely known to the public. The diversity of cultures also requires proper socialization.

CONCLUSION

The transformation of NRE from fossil energy on a global level is underway. The transition still takes time, given the various factors involved in this transformation including its geopolitical impact. NRE will be a “game-changer” for global geopolitical maps and relations between countries. The main NRE players have begun to show themselves with various indicators: NRE policies, investment

allocation, increasing NRE mix in various sectors (building, transportation, industry), NRE innovation, investment, and exports as well as higher private involvement.

In terms of potential, Indonesia is in line with the main players, especially for the development of solar energy, bioenergy, and geothermal. Indonesia's energy consumption is also included in the group of world countries that are growing very fast, even electricity consumption will increase threefold by 2030, including transportation and industry (IRENA 2017:3). This means that there is a very large market for NRE development. From a policy perspective, the government has an ambitious target to increase the use of NRE, if it is consistent, it is likely to be achieved two decades sooner. The benefits of developing NRE are predicted to outweigh the costs because high uptake will reduce the total cost of the NRE system, national energy security will be strengthened, Indonesia will also contribute to global projects dealing with climate change, including the long-term "clean energy" impact, expansion of NRE will open up opportunities for renewable energy employment and encourage technology transfer.

The overall aggregate output of NRE will position Indonesia in the international world in line with the big players that have emerged such as China, the United States, Brazil, and Europe, besides of course being "the leading actor in ASEAN". Various solutions to increase Indonesia's NRE are available if Indonesia can focus on the greatest potential and the most open opportunities in the most strategic sectors such as industry, buildings, transport, and community needs

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