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THE IMPACT OF THE COVID-19 PANDEMIC ON INDONESIA'S ENERGY TRANSITION ©Σ

IVA RACHMAWATI *

ABSTRACT

The COVID-19 pandemic has provided a positive impetus for the energy transition for several countries. With the lockdown policy, which causes a decrease in fossil energy consumption, fossil energy prices become unstable. The decreasing pollution level has made them increasingly aware of the need to encourage renewable energy. Increasing investment in renewable energy indicates that the energy transition is positive. This article examines Indonesia's energy transition, which has been affected by the COVID-19 pandemic, even though it has committed to achieving a mixed level of 23% by 2025. Through a literature review method regarding renewable energy policies during the pandemic and direct interviews with stakeholders related to renewable energy, this article claims that the impact of the Covid 19 pandemic on Indonesia's energy transition is insignificant. On the contrary, Indonesia experienced a slowdown in the energy transition during the pandemic. The downturn in the energy transition happened because previous policies regarding the energy sector did not favor renewable energy in Indonesia. Coal is still a strategic sector because of its cheap price and increasing demand. Investment and subsidies still favor the coal sector rather than renewable energy. The implication of this study is a change in government policy towards the energy transition through technology and investment for better energy security and the environment.

Keywords: COVID 19 pandemic, Renewable Energy, Policy, Investment, Technology.

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* Iva Rachmawati, Ph.D is a senior lecturer at the Department of International Relations, Faculty of Social and Politics, Universitas Pembangunan Nasional "Veteran" Yogyakarta, Jl. Babarsari Jl. Tambak Bayan No.2, Janti, Caturtunggal, Kec. Depok, Kabupaten Sleman, Daerah Istimewa Yogyakarta 55281. Email: iva.rachmawati@upnyk.ac.id.

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KESAN PANDEMIK COVID-19 TERHADAP TRANSISI TENAGA INDONESIA

IVA RACHMAWATI

ABSTRAK

Bagi beberapa negara, pandemik Covid-19 telah memberikan dorongan positif untuk peralihan tenaga. Dengan dasar sekatan pergerakan yang menyebabkan pengurangan penggunaan tenaga fosil, harga tenaga fosil menjadi tidak stabil. Penurunan tahap pencemaran telah meningkatkan kesedaran tentang keperluan untuk menggalakkan tenaga boleh dibaharui. Peningkatan pelaburan dalam tenaga boleh dibaharui menunjukkan bahawa peralihan tenaga adalah positif. Artikel ini mengkaji peralihan tenaga di Indonesia yang telah dipengaruhi oleh pandemik Covid-19, walaupun ia telah berkomitmen untuk mencapai kadar campuran sebanyak 23% menjelang tahun 2025. Melalui kaedah ulasan literatur mengenai dasar tenaga boleh dibaharui semasa pandemik dan temu bual langsung dengan pihak berkepentingan berkaitan tenaga boleh dibaharui, artikel ini menghujahkan bahawa kesan pandemik Covid-19 terhadap peralihan tenaga di Indonesia tidak signifikan. Sebaliknya, Indonesia mengalami kelewatan dalam peralihan tenaga semasa pandemik. Penurunan dalam peralihan tenaga berlaku kerana dasar-dasar sebelumnya mengenai sektor tenaga tidak mengutamakan tenaga boleh dibaharui di Indonesia. Arang batu masih merupakan sektor strategik kerana harganya yang murah dan permintaan yang meningkat. Pelaburan dan subsidi masih mengutamakan sektor arang batu berbanding tenaga boleh dibaharui. Implikasi kajian ini adalah untuk mendorong kepada perubahan dalam dasar kerajaan terhadap peralihan tenaga melalui teknologi dan pelaburan untuk keselamatan tenaga dan alam sekitar yang lebih baik.

Kata kunci: *Pandemik COVID-19, tenaga boleh dibaharui, dasar, pelaburan, teknologi*

Introduction

The Covid-19 pandemic has brought changes in various aspects of human life. The social, economic, governance and energy consumption sectors have experienced significant shifts (Nicola et al. 2020; Redbird, Harbridge-Yong and Mersey 2022). The changes were mainly caused by the lockdown policy, which forced everyone to stay at home and not meet each other directly to control the spread of the pandemic (Kraemer et al. 2020). Almost all economic and social activities in the community have stopped, which has significantly impacted the economic and social conditions of the community. Another impact felt is the decrease in energy consumption, especially transportation energy. Energy for other needs, such as industry, has also been significantly impacted by the lockdown policy.

The government wanted to express the desire to reduce the use of fossil energy long before the COVID-19 pandemic occurred. Reducing fossil energy consumption is part of efforts to respond to climate change, a joint commitment through the Paris Agreement. The issue of climate change is the main driver for every country to reduce carbon dioxide emissions by replacing fossil energy with alternative energy that is more environmentally friendly (Gielen et al. 2019; Osman et al. 2023). However, until 2019, carbon dioxide emissions have increased since 196 countries of UNFCC members signed the Paris Agreement. The signing means no government has made a significant effort to realize its commitment to reducing dependence on fossil energy. According to data from Statista.com (2023), since 2015, carbon dioxide emissions have been at 35.56 billion metric tons and continue to increase to 37.08 billion metric tons in 2019.

The COVID-19 pandemic has influenced reducing carbon dioxide emissions because this is one of the consequences of the lockdown policy. Overall, total carbon emissions in 184 selected countries were reduced by 438 Mt in 2020 compared to 2019 (Ram). Based on IEA and Global Carbon Project data and projections published in April and May 2020, there was a reduction in global CO2 emissions in 2020, compared to the 2019 level of –8% after lockdown (Dafnomilis et al. 2020). The cessation of economic and social activities has forced people not to consume energy, especially for transportation. Some industries have reduced their activities due to a lack of labour, decreased consumption, and calculation of production costs. Electrical energy consumption experienced a shock at the start of the pandemic and experienced a sharp decline (Buechler et al., 2022). This sharp decline tends to be driven not by the number of victims but by the strictness of government policy on population mobility. Fuel consumption decreased, which impacted reducing carbon dioxide emissions (Dembínska et al. 2022; Zhang, Li, and Wang 2021).

In Indonesia, the same situation also occurs where electricity consumption outside the household decreases, but household electricity needs increase. Unfortunately, purchasing power conditions due to the pandemic have declined sharply, so the government is providing subsidies by extending electricity bill payments to pre- and postpaid PLN customers in the 450 VA and 900 VA groups.30. The government allocated IDR 3.5 trillion for prepaid customers. In contrast, the government provided a relief scheme to postpaid customers (Komala 2020). Data shows that domestic energy consumption has experienced a sharp decline since 2019, reaching 1 billion to 905.6 million in 2020 and 909.24 million in 2021 (Kusnandar 2022). The decrease in domestic electricity consumption impacts the decline in coal realization. In 2020, the realization of domestic coal utilization will only reach 85% of the target of 155 million tons(Kementrian Energi dan Sumber Daya Mineral, 2021)

In some countries, the increase in the transition of electricity generation and primary energy mix from carbon-intensive energy to modern renewable energy (such as solar and

wind power) accompanies the decline of fossil energy consumption. (Li, Qi, & Shi 2022) research in China found that the COVID-19 pandemic increased low-carbon electricity generation by 4.59% (0.0648 billion kWh), mainly driven by solar and wind power, especially solar power plants. In China, renewable energy consumption increased by 24.85 Mtoe in 2020 compared to the previous year. In other developed countries such as America, renewable energy consumption increased by 8.01 Mtoe, Germany by 0.05 Mtoe, and the UK by 0.56 Mtoe; in developing countries such as Brazil, renewable energy consumption increased by 0.91 Mtoe, India by 5.68 Mtoe, Turkey by 1.83 Mtoe and Mexico by 0.56 Mtoe (Li et al.2022). This increase in consumption must be connected to infrastructure development and investment in renewable energy.

Despite some improvements, infrastructure development and the operation of renewable energy have simultaneously experienced slowdowns due to lockdown policies (Kuzemko et al. 2020). Workers unable to perform their duties and operators unable to run their operations have caused numerous renewable energy projects to halt. However, the deceleration in infrastructure development did not completely stop the clean energy supply. Several developed countries already possess relatively robust clean energy supply systems. In addition to having a resilient renewable energy system and achieving cross-sector circular economies, these developed nations also pursue more aggressive investment efforts and incentives for environmentally friendly energy. Notable investments in renewable energy include China, which invested $758 billion, nearly 31% of the total global investment in the 2010s; the United States, with $356 billion or 14% of the worldwide total; Germany, with $179 billion; and the United Kingdom with $122 billion. Among developing nations, India has made the most significant investment in renewable energy, totalling $ 90 billion (Frankfurt School of Finance & Management, 2019).

Due to the pandemic, fluctuating oil prices make the return on fossil fuel investment unpredictable. This condition triggered a surge in renewable energy investment in developed countries (Hoang et al., 2021). Therefore, many factors make it possible for renewable energy investment to have long-term benefits. There is reason to believe that this crisis has caused instability in conventional energy markets, accelerating the transition of energy infrastructure to renewable energy. The instability in fossil energy markets is in line with countries' efforts to achieve carbon reduction targets and improve the security resilience of national energy systems (Li et al. 2022), proving a bubble in the non-renewable energy market. Shaikh's research shows that periods of coronavirus infection have led to slowing economic growth in many countries worldwide. Still, the switch to renewable energy is believed to improve the population's quality of life and ensure economic growth. The COVID-19 pandemic has not hampered but encouraged bilateral cooperation in the field of renewable energy among "Belt and Road" partner countries, with China as the core (Wang, Huang and Li 2022)

Renewable power generation has fared relatively well, especially in markets with significant capacity. The COVID-19 pandemic provides opportunities for accelerating energy transition in some countries. This article examines the practice of energy transition in Indonesia during the COVID-19 pandemic, considering that Indonesia has a reasonably high target for renewable energy mix in 2025.

Literature Review

The impact of the COVID-19 Pandemic on renewable energy development has two different ideas. First, the COVID-19 pandemic is believed to encourage the use of

renewable energy, increase the construction of facilities, and increase investment in renewable energy. Bianchi 2020; Bohlmann et al. 2023; Li, Qi, and Shi (2022) consider the COVID-19 Pandemic to be a catalyst for transformative changes in energy. The crisis resulting from the COVID-19 Pandemic and related control measures have significantly reduced energy consumption in many countries and, in turn, affected the use of renewable energy (Chiaramonti & Maniatis, 2020; Song et al., 2021) and increased investment capitalization in renewable energy (Shaikh et al. 2022; Wan et al. 2021) and renewable energy technology (Song et al., 2021) In addition, lockdown policies encourage some countries to improve supply chain localization or look for flexible solutions for resource development (Gebreslassie et al. 2023; Olabi et al. 2022).

On the contrary, Edomah and Ndulue (2020) and Kuzemko et al. (2020) warned that these changes are only temporary and that government policies will be vital to the energy transition demonstrated during the pandemic. Although there has been a significant decrease in fossil energy consumption, it is only a logical consequence of implementing lockdown policies. Abdullahi et al. (2017) are still determining if the pandemic can encourage green energy, considering the great need for the country to restore its economy due to the COVID-19 Pandemic. The COVID-19 Pandemic has significantly reduced renewable energy production in the short and long term (Dong, Ji, Mustafa, & Khursheed, 2022). The state prefers to channel to the community's health sector and economic resilience rather than building renewable energy facilities (Birol, 2020). Conversely, the construction of renewable energy facilities is increasingly facing severe challenges due to the pandemic (Dong et al. 2022) and investment in renewable energy (Li et al. 2022). Meanwhile, the long chain of the coal industry is one of the causes of the absence of the pandemic as a driver of energy transition ((Mikulska 2019).

Significant promotion of the energy transition is a finding in Kaili's research on China's energy transition. China's energy transition during the pandemic showed that the generation of low-carbon power plants increased in use by 4.59% (0.0648 billion kWh) compared to the previous period. (Li et al. 2022) analysis indicates that the COVID-19 Pandemic is driving the transition from high-carbon energy to modern renewable energy, especially solar and wind power plants. In China, the energy transition is part of the economic recovery project due to the COVID-19 Pandemic. The same applies to countries where economic stimulus in recovery projects includes long-term low-carbon development and climate policies. Thus, investment in the energy transition can achieve economic recovery in the short term (after COVID-19) and contribute to long-term social development (Cholifihani 2022; Rayyan, Culas, and Theseira 2021).

In addition to being part of the economic recovery package, falling oil prices can accelerate the energy transition. Global economic stimulus packages and increased funding for environmental projects can help restore or boost renewable energy growth. A simple way to achieve this is to allocate most or all energy stimulus funds to renewable energy projects. Increased fiscal incentives can also encourage further development of renewable energy projects (Olabi et al. 2022). The situation supports the policy. First, the instability and vulnerability of fossil fuels can enable exporting countries to switch to more diverse energy sources, such as renewable energy. The switch to more diverse energy sources can spark awareness of its vulnerability and encourage policies that support clean energy. This diversification is possible as domestic demand increases and exporters must look for alternatives. Second, low oil prices could be an opportunity to remove fossil fuel subsidies that burden budgets. Although energy price reform is a political issue, periods of low oil prices could facilitate these measures, shifting funds from subsidies to clean energy options (Bianchi, 2020).

Africa leveraged the recovery momentum from the COVID-19 Pandemic to support renewable energy and energy efficiency through a Just Transition. To realize the plan,

African governments, academia, and African industry work together to develop reliable, affordable, sustainable, and modern energy infrastructure. Governments in several African countries encourage using local energy technology by involving local industrial lines (Gebreslassie et al. 2023). Locally located renewable energy components can help address supply chain disruption issues. It also opens opportunities to boost the economy and economic growth and create more jobs (Olabi et al. 2022). For example, Nigeria, South Africa, Algeria, Egypt, Kenya, Tunisia, and Ethiopia began to build solar power industries, including components such as wind turbines and solar panels. Energy technology localization policies are carried out through a series of policies, including Strengthening public-private partnerships, Strengthening University-Industry-Government partnerships (triple helix), Introducing intellectual property rights in the academic system, Developing incentive packages, Developing conducive utility procurement, Localizing energy development value chains and Renewable Portfolio Standards.

While there are some positive views on the impact of the pandemic on the energy transition, others suggest that the condition is only temporary. The sustainability of the post-pandemic transition will depend on government policy. Environmentally friendly energy policies through economic stimulus packages and reductions in fossil energy prices do not necessarily guarantee a transition to renewable energy. Dong et al. (2022)'s research suggests that in the short term, the COVID-19 Pandemic hurts hydropower generation in the baseline model. The failure of the transition was caused by the decline in energy prices due to the pandemic, which also impacted renewable energy prices. This kind of condition occurs not only in one country but also in the world's energy market. Ivanov and Dolgui (2021) stated that disruptions in renewable energy are caused by network, process, and control. The network refers to a guaranteed renewable energy supply chain starting from facilities, technology, and markets. If the country depends on supply chains from outside the country, the pandemic will hurt the sustainability of renewable energy. The process refers to the country's efforts to control supply chance, predict failure, and recover supply chance affected by the pandemic. The resilience of responses to change and the speed with which impacts are countermeasures affect the energy transition. Control refers to how countries can avoid disruption tails (disruptions arising from uncoordinated production policies during the pandemic), which impact post-disruption Supply Chain instability. The same condition also occurred in Indonesia, where the government chose short-term policies to deal with the impact of the pandemic on the economy. Economic stimulus policies for communities affected by the pandemic are still the government's favourite, compared to the encouragement of the development of renewable energy technology (Hartono et al. 2021)

In addition to the lack of policies in dealing with the impact of the pandemic, the lack of government incentives for renewable energy harms the development of renewable energy. As a result, the renewable energy industry was forced to stop producing (Hoang et al. 2021). In many countries, incentives are more shifted to the health sector and social impact mitigation (Birol 2020; OECD 2020). The rapid spread of the virus, the high number of victims, and the massive socioeconomic impact are the main reasons the government diverts most climate mitigation funds to the health and social benefits sector (Dong et al. 2022; Rayyan et al. 2021; Redbird et al. 2022). As a result, support for renewable energy development and facilities has decreased. Dong's research shows that disruption of the economic and social sectors, followed by low demand for energy, including renewable energy and financial institutions unable to work correctly amid the pandemic, has resulted in the decline in the renewable energy sector. In line with Dong et al. (2022), Li et al. (2022) also found that the pandemic's impact on energy demand, performance, facility maintenance, and supply chain guarantees has influenced the decisions of renewable energy investors.

Coal is a reasonably cheap energy resource compared to other fossil and alternative energy sources. In addition, coal is a fossil energy that is widely spread in many developing countries. Technology is relatively simple and an industry that can absorb much labour, making many developing countries choose to maintain the coal mining industry. Moreover, energy security is the primary consideration of every developing country (Febriyanti, Murtadho and Almattushyva 2023; Mikulska 2019). Energy security is related to a country's ability to provide its natural energy supply at an affordable price. To ensure energy supply and affordable prices, coal, which is spread domestically, becomes the leading choice rather than importing energy at a much greater cost and threatening energy prices. Therefore, in many developing countries, they even provide subsidies to the coal industry and ignore policies that are more pro-environment to maintain the coal industry (Arinaldo & Adiatma 2019; Mikulska 2019; Sumarno, Sihotang and Prawiraatmadja 2022).

From the literature review, the momentum of the Covid-19 pandemic encourages countries to accelerate the energy transition. However, many countries are trapped in short-term policies to meet people's cheap energy needs. Warnings regarding short-term policies during the pandemic and energy security are the keywords for this research in understanding Indonesia's energy transition policy due to the COVID-19 pandemic.

Discussion

Renewable Energy Policy in Indonesia and the Slow Energy Transition

Renewable energy is energy that comes from energy sources that are continuously replenished by nature. Renewable energy is "energy obtained from continuous or repeated currents in the natural environment." Law No. 30 of 2007 (Tipperary Institute 2007) concerning renewable energy is energy derived from renewable sources, including geothermal, wind, bioenergy, sunlight, streams, and waterfalls, as well as movements and temperature differences in the ocean layer. Renewable energy utilizes environmentally friendly energy sources that do not pollute the environment and do not contribute to climate change and global warming. Breakthrough energy includes solar/solar energy, wind power, biomass, hydropower, geothermal, and wave energy.

In line with Indonesia's commitment to the Paris Agreement, through Law No. 30 of 2007 on Energy (Article 20 Paragraph 3), which mandates an increase in the provision of new and renewable energy, both at the national and regional levels, Indonesia began energy transition steps. This step is strengthened by Government Regulation No. 79 of 2014 concerning the National Energy Policy, which sets a target of a new and renewable energy mix in 2025 of at least 23% and 31% by 2050.

Referring to Winanti (2021), energy transition in the Indonesian context is a transformation or transition from energy originating from fossils, including the technology accompanying it, to cleaner, renewable, and more sustainable energy. The main objective of an energy transition is to achieve national energy security, including the availability and affordability of energy prices by the wider community and easy access to that energy. The Indonesian government issued Law No. 30 of 2007 concerning Energy (article 20 paragraph 3), which mandates increasing the supply of new and renewable energy at the national and regional levels to accelerate renewable energy development. The energy transition policy refers to Indonesia's extraordinary renewable energy sources. The National Energy Council (2021) recorded that the total renewable energy potential for electricity generation is 437 GW, but only 2.4% has been utilized. Meanwhile, biodiesel utilization in 2020 reached 8.6 million KL for biodiesel mixtures.

The utilization of EBT for electricity generation in 2020 was 10.5 GW or 14.4% of the total generating capacity.

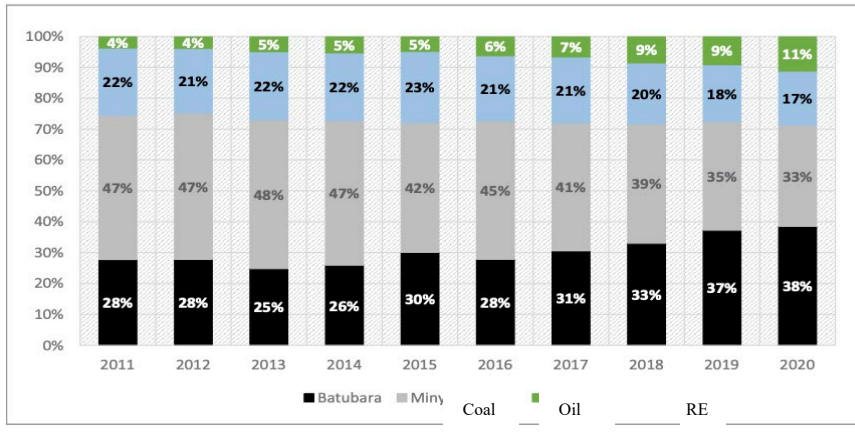
Table 1. Indonesia's Renewable Energy Reserves.

Jenis Energi	Potensi (GW)	Realisasi (GW)	Pemanfaatan
Panas Bumi	23.8	2.1	9.0%
Surya	207.8	0.2	0.1%
Angin	60.7	0.2	0.3%
Air	94.6	6.1	6.5%
Bioenergi	32.7	1.9	5.8%
Tenaga Laut	17.9	-	-

Source: Dewan Energi Nasional, 2021

In 2014, the government set an energy mix target of 23 percent in 2025 and 31 percent in 2050 through Government Regulation 79 of 2014. The government also issued Presidential Regulation No. 4 of 2016, where Article 14 states the acceleration of electricity infrastructure development and the use of renewable energy, as well as the Ministry of Energy and Mineral Resources Regulation No. 12 of 2017 concerning the promotion of renewable energy. The government's seriousness in encouraging renewable energy can also be seen by issuing Minister of Energy and Mineral Resources Regulation No. 49 of 2018 concerning the Use of Rooftop Solar Power Generation Systems by Consumers of State Electricity Company or Perusahaan Listrik Negara (PLN) and Presidential Regulation of the Republic of Indonesia Number 112 of 2022 concerning the Acceleration of Renewable Energy Development for the Supply of Electric Power. These policies were prepared solely to support Indonesia's commitment to achieve the renewable energy mix target of 31% by 2050. This commitment is starting to be seen with Indonesia's increasing use of renewable energy. The 10-year EBT mix rose from 3.8% in 2011 to 11.3% in 2020 (See Table 2). However, it must be acknowledged that this achievement is still very far from the target set by the government, namely 23% by 2025. In other words, Indonesia's energy transition is experiencing delays (Jati 2023; Simanjuntak 2022)

Table 2. Primary Energy Mix



Source: Dewan Energi Nasional, 2021

Restrictions on community activities during the COVID-19 pandemic forced people to stay indoors. Limited community movement has caused the cessation of some activities outside the home, such as economic activities, education, offices, and industry. More activities are also done at home online. Changes in people's activities cause changes in energy consumption patterns.

The COVID-19 pandemic has resulted in a decrease in national energy needs in 2020. The Center for the Study of Process and Energy Industries (PPIPE) - BPPT stated that energy consumption decreased by 11.0% (OPT/optimistic scenario), 15.7% (MOD/optimistic scenario), and 20.5% (PES/pessimistic scenario), or a decrease of around 107.4 -199.2 million BOE (Barrel Oil Equivalent)). The most significant decline occurred in the commercial sector, amounting to 15.0% (OPT), 22.2% (MOD), and 29.5% (PES), ranging from 7.4 - 14.5 million BOE. The industry was the second affected sector, experiencing a decline of around 13.3% (OPT), 19.4% (MOD), and 25.6% (PES), ranging from 45.9 - 88.5 million BOE. Then transportation experienced a decline of around 12.8% (OPT), 18.1% (MOD), and 23.4% (PES), ranging from 54.1 - 98.5 million BOE. Meanwhile, the household sector experienced an increase in consumption of 1.6% (OPT), 3.3% (MOD), and 4.9% (PES), ranging from 2.3 - 6.9 million BOE (Sugiyono, Fitriana, Pengkajian, & Teknologi 2020).

Fuel oil (Bahan Bakar Minyak or BBM) was the energy that had the most significant impact on the decline in energy consumption during the COVID-19 pandemic. National fuel consumption from January to June 2020 was only around 117 thousand kiloliters (KL) per day, down 13% compared to 2019, as much as 135,000 KL per day. The decline in fuel consumption caused Pertamina to suffer losses. Pertamina's losses reached 67.92 million United States (US) dollars or the equivalent of IDR 11.13 trillion (exchange rate IDR 14,500/US dollars) in the first semester of 2020 (Gaikindo, 2020). Likewise, coal, the primary energy source for the industrial sector, also experienced a decline in consumption. Indonesia's coal production fell by 11% in the first 11 months of 2020. Indeed, coal production in 2020 was still able to reach the target of 93% or the realization of 514.20 million tons. However, most of the coal production is intended for export, namely 218.17 million tons, and only 108.45 million tons for domestic consumption (Mulyana, 2020). Likewise, LNG consumption also decreased by 17%. If in 2019, the realization of domestic consumption was recorded at 38.3 standard cargo or 111 million MMBTU, then domestic LNG consumption in 2020 was only 23.5 standard cargo or in volume 68.35 million MMBTU (Million British Thermal Units) (Mulyana, 2021). However, despite the decline, ESDM claims that fossil energy still dominated the primary energy mix with an allocation of 32% Oil, 38% Coal, 19% Gas, and 11.2% EBT (Kementerian Energi dan Sumber Daya Mineral n.d.).

Energy Security

Even though the use of fuel and gas decreased during the COVID-19 pandemic, and renewable energy experienced a slight increase (Table 2), coal is still experiencing an increase. The rise in coal consumption aligns with Indonesia's coal policy before the pandemic. Before the Covid-19 pandemic occurred, the Indonesian government, through the 2015-2019 National Medium Term Development Plan (RPJMN 2015-2019), had planned to build a power plant with a capacity of 35,000 MW, of which 25,000 MW would come from coal (Kementrian Energi dan Sumber Daya Mineral, 2015) This plan aims to provide better access to electricity for the community and encourage economic growth. 62% of coal in Indonesia still dominates electricity generation (CNN Indonesia 2022). However, the impact of this policy is the increasing consumption of Indonesian coal (Nugroho 2017), and at least the State Electricity Company will absorb 209 tons of coal (Yazid 2015)

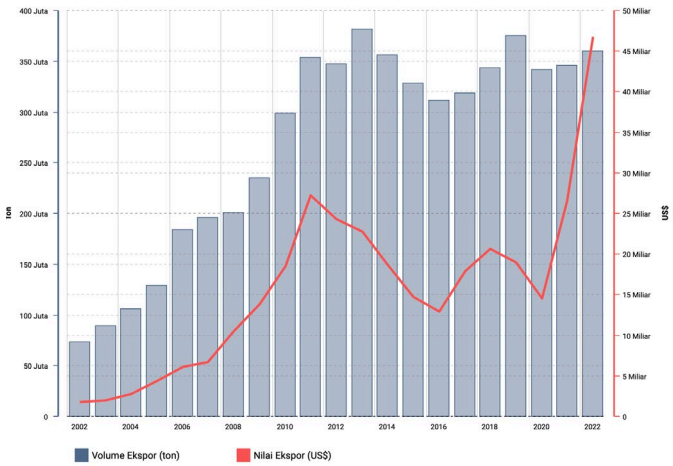
The government chooses coal as a source of electrical energy solely for energy security. The availability of cheap energy that citizens quickly obtain is a government priority. Energy availability is part of energy security. Energy security is a condition of the availability of oil reserves in sufficient quantity and at an affordable price (Khatib 2001). Energy security means having adequate and reliable energy reasonably priced (Yi-Chong 2007). This also includes the ability to protect and save the energy needed. Some people consider energy security to be ensuring that the country always has an adequate energy supply stable, which includes the way the country produces, uses, and distributes energy (Toichi 2006)

In Indonesia, coal contributes to the energy sector and national development as a source of APBN revenue. The coal sector remains the most prominent mainstay for state income through non-tax state revenues (PNBP). As much as 85% of the total mineral and coal PNBP comes from coal, and in 2020, this achievement reached 110.15% of the set target. Throughout 2020, the amount of PNBP received was IDR 34.6 trillion, exceeding the target of IDR 31.41 trillion. This situation means coal producers contributed around IDR 29.41 trillion of the total BNPB received (Manajemen Pengawasan PNBP, 2022) Besides land rent and royalties/taxes, coal makes the most significant contribution through domestic and international coal sales.

Indonesia's coal production has increased significantly since 2006, and coal exports have increased by about 250% in just a decade. Since 2016, it has always been above the target of the National Energy General Plan (Rencana Umum Energi Nasional/RUEN). Even the annual target set by the Ministry of Energy and Mineral Resources is above the target of RUEN and Rencana Pembangunan Jangka Menengah Nasional (National Medium-Term Development Plan/RPJMN). In 2018, for example, the targets of RUEN and RPJMN were 403 million tons and 406 million tons, respectively, while the target of the Ministry of Energy and Mineral Resources is 485 million tons and according to MODI (Minerba One Data Indonesia, https://modi.esdm.go.id) actual production is 557 million tons (Arinaldo and Adiatma 2019)

Coal exports in 2020 declined but soon grew again (Table 3). Indonesia exported coal weighing 360.28 million tons throughout 2022, rising 4.29% compared to 2021. The Central Statistics Agency noted that the value of Indonesia's coal exports in 2022 reached USD 46.74 billion, up 76.16% compared to 2021 and the highest record in the last two decades. Coal exports are also supported by coal prices that continue to rise in the international market (Suharsono & Lontoh, 2022). Over 80% of Indonesia's coal production is produced to meet exports. China, India, and Japan are Asia's largest export destination countries for Indonesian coal Arinaldo and Adiatma 2019; Kusnandar 2023).

Table 3. Indonesian Coal Exports



Source: (Ahdiat, 2023)

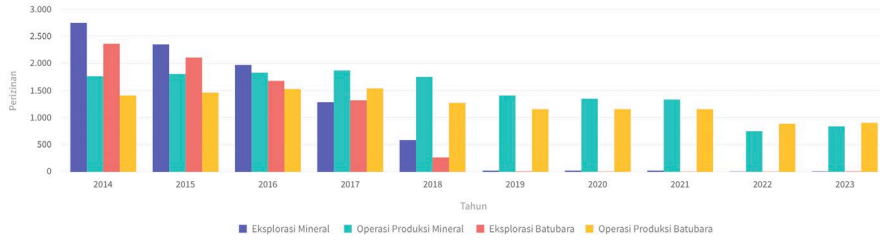
The EIA report (EIA 2023) states that 2022 global coal demand reached an all-time high, exceeding 8.3 billion tons. The weakening global economy causes the high demand for coal, as coal is easier and cheaper than other fuels. This increase was driven by the use of coal in power generation, mainly due to weak nuclear and hydroenergy production. In China, coal demand grew 4.6%, reaching a record 4,519 Mt. This exceeded estimates because the coal produced has a low calorific value and is used in various industries to produce synthetic fuels, plastics, and fertilizers. Meanwhile, India's economy grew 6.9%, boosting coal demand by more than 8%, to reach 1,155 Mt. This makes India the only country other than China to exceed 1.1 billion tons. In the European Union, coal demand rose 0.9% to 448 Mt, driven by power plants switching to coal due to high gas prices and Russian gas scarcity. Two factors supporting Indonesia's becoming the most significant exporter are its vast production and low operational costs (Rosyid and Adachi 2016).

Financial Strain: Foreign Investment and Coal Sector Subsidies

More pro-coal policies are not easy to change, considering several political interests that do not want renewable energy development in Indonesia because they want to maintain the benefits of non-renewable energy management. Some influential political figures have businesses in non-renewable energy, such as Aburizal Bakrie, who owns the largest coal mining companies such as Bumi Resources, Kaltim Prima, and Arutmin. Other figures listed as owners of coal companies are Defense Minister Prabowo Subianto, who is the largest shareholder of Nusantara Kaltim Coal; Coordinating Minister for Maritime Affairs and Investment, Luhut Binsar Pandjaitan is a shareholder of PT Toba Sejahtra; Coordinating Minister for Economic Affairs Airlangga Hartarto is the owner of PT. Multi Harapan Utama, Minister of Communication and Information Technology, Johnny G Plate, the largest shareholder in PT Yama Bumi Palaka and Minister of Tourism and Creative Economy Sandiaga Uno is one of Adaro Energy's shareholders. Cabinet Secretary Pramono Anung is a former director of PT Tanito Fragrant. Febriana noted that with the dominance of political figures in the ownership of coal companies, coal in Indonesia's energy security became dominant and weakened the government's commitment to the energy transition. The National Exploration Committee even stipulated that coal should be prioritized as a national development capital, not as a commodity (for trade/export) (Yasin et.al. 2021).

Another policy that provides opportunities for extra coal to develop is the Decentralization of Mining Law in 2009, which provides opportunities for local politicians to benefit from the coal industry (Greenpeace et al. 2018). The decentralization policy is contained in Government Regulation 75/2011, which actively transfers licensing authority from the central government to regional governments. Even though coal exploration permits have decreased sharply, coal production is still relatively high (See Table 4); the number of new coal production permits is shown by the yellow bar).

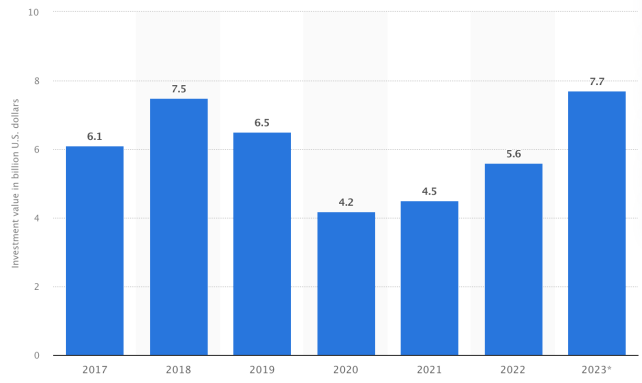
Table 4. Indonesian Coal Production Permit



Source: MODI (2020)

Foreign investment and coal sector subsidies in Indonesia are manifestations of the government's alignment. In several countries, including Indonesia, coal companies continue to receive foreign investment support (Clark, Zucker and Urpelainen 2020; Gallagher et al. 2021) and support from the government by providing subsidies to coal companies. The number of foreign investments in the coal and other minerals sector continues to increase even during the Covid-19 pandemic. Table 5 shows that foreign investment fell in 2020 but increased again and exceeded investment in 2018 before the COVID-19 pandemic (Sekaringtias, Verrier and Cronin 2023).

Table 6. Value of Investments in the Coal and Mineral Industry in Indonesia from 2017 to 2022 with target for 2023



Source: Statista (2024)

Foreign investment policy in the mineral sector in Indonesia has a long history. Starting with Law No. 1 of 1967 concerning Foreign Investment and Law No. 11 of 1967 concerning Basic Provisions of Mining, foreign mining investment aims to accelerate development. Along the way, contracts of work often become the government's primary

concern by providing some benefits for foreign investors. However, environmental issues and nationalism gradually made the contract of work more friendly to both problems. After undergoing several changes, Law No. 3 of 2020 is the latest mining law that provides legal certainty to business actors (extension of work contracts) and strictly regulates the company's obligations in reclamation. Thus, "old investor" business actors carrying out their activities, holders of Coal Mining Concession Work Agreements, and holders of Special Mining Business Licenses obtain long-term investment certainty.

Investment in the mineral and coal subsector in 2020 had decreased from the target set. Investment realization amounted to USD 4.015 billion, below the initial provision of USD 7.749 billion. However, as of December 31, 2022, investment realization reached USD 5.69 billion, more significant than the target of USD 5.01 billion. Non-tax state revenue deposited to the state amounted to IDR 183.35 trillion, exceeding the target of IDR 101.84 trillion (Rizaty, 2023). Director General of Minerba (Mineral and Coal), Ridwan Djamaluddin, in the 2022 Performance Achievement Press Conference, claimed that coal commodities alone contributed 80 percent of PNBP's royalty value. In 2022, investment in the mineral and coal subsector reached 113.5 percent of the original plan, while PNBP exceeded 180 percent of the target (Dir.Jend Minerba 2023).

In addition to the ease of investment, the Ukraine war has prompted several investors to divert their funds to the coal sector. Mizuho Financial, Mitsubishi UFJ Financial, and SMB Group from Japan are the investors who shifted their funds to the coal sectors. Barclays of the United Kingdom and Citigroup of the United States. BlackRock, the largest investor in the United States, re-accumulated coal shares on the Indonesia Stock Exchange in October 2022. The fund manager of more than US$ 10 trillion increased the portion of share expenditure for PT Bukit Asam Tbk. (PTBA), PT Adaro Minerals Indonesia Tbk. (ADMR), PT Harum Energy Tbk. (HRUM), PT Indo Tambangraya Megah Tbk (ITMG) to PT Indika Energy Tbk. These coal companies scored higher profits than in 2021 (Maruf 2022).

The COVID-19 Pandemic has not significantly affected the trend of mineral investment in Indonesia because the state also provides subsidies for the industry. Coal subsidies remain to keep the economy stable during the pandemic. In the post-COVID-19 pandemic, the coal markets, including China and India, increased significantly. The pandemic has dramatically reduced coal consumption, decreasing demand for coal, including in Indonesia. In Indonesia, the government added coal mining to the list of business sectors eligible to receive fiscal incentives to mitigate the impact of the COVID-19 Pandemic through the Volume II budgetary stimulus package. This package offers four types of incentives: import tax exemption for six months, income tax reduction of 30% for six months, personal income tax borne by the government, and acceleration of restitution with the limit increased to Rp5 billion (Kurniati 2020).

As a result, renewable energy cannot compete with coal in providing cheap energy for the PLN (Febriyanti et al., 2023). PLN continues to use new coals, considering the price is much cheaper than renewable energy. Based on a report by the Ministry of Energy and Mineral Resources, the realization of investment in Indonesia's new and renewable energy sector is US$ 1.6 billion in 2022. The value is still the same as the previous year. Investment in the RE sector has yet to reach the target set at US$4 billion. The value is only 5.9% of the US $ 26.9 billion domestic energy investment (Rizaty 2022).

No one could separate renewable energy from the technology accompanying it. Indonesia's technological ownership in the new renewable energy sector still needs to be improved, and it is very dependent on other countries. In the Indonesian context, new and renewable energy (EBT) technology and components still need to be imported, especially for solar power installations, according to the executive director of the Institute for Essential Services Reform (IESR). However, many are still imported because of the ability of local products to meet project needs, namely highly efficient solar modules, with high efficiency. Solar module capacities above 20% and above 500 Wp per chip still need to be created. Apart from that, solar module manufacturers in Indonesia are outside the 'Tier-1' category. Unfortunately, only the Tier 1 modules are bankable to get project financing from international financial institutions (Umah 2021).

According to Notosudjono (2006), Indonesia can produce most of the components used in photovoltaic systems. However, the challenge is that the main components, namely modules, must still be imported from abroad. The same happens in the geothermal sector, which depends on imported products. The Indonesian Electricity Society also confirmed that around 60% of PLTU (*Pembangkit Listrik Tenaga Uap* or Steam Power Plant) components still come from imports, including energy transmission and distribution ((Satrianegara, 2019).

Table. 7. Energy Classification Based on Conditions (2021)

Renewable Energy	The Component Status
Wind	The majority of components are imported
Solar	The majority of components are imported.
Biomass	Some can be produced domestically, except for turbines and generators.
Geothermal	Some can be produced domestically, except for turbines and generators.
Water	Most can be produced domestically except for turbines and generators.
Microhydro	All components can be carried out at the national level.
Sea Wave	Still, Indonesia's development and pilot project stage has no commercial stage yet.
Battery	The battery factory is still in the construction stage, and lithium batteries are still being imported.

Source: Fitrady (2021)

Meanwhile, wind energy development in Indonesia is still in the experimental stage and has yet to reach the commercialization stage. The government has appointed the National Aeronautics and Space Administration (Badan Penerbangan dan Antarikasi Nasional/LAPAN) to develop wind energy technology. LAPAN has conducted several pilot projects in East Nusa Tenggara, West Nusa Tenggara, Yogyakarta, and Jepara. However, the development of ocean wave energy still needs to be improved. A few years ago, the Agency for the Assessment and Application of Technology (Badan Pengkajian dan Penerapan Teknologi/BPPT) launched a 100 kW Marine Thermal Energy Conversion (OTEC) pilot project in Bali. Unfortunately, despite positive results, the project risks stalling because the cost is still very high.

Micro-hydro is another renewable energy process that is relatively independently developed. Micro-hydro energy has been applied on several islands in Indonesia, including Java, Bali, Sumatra, Sulawesi, Irian Jaya, and several islands in NTB. In general, workshops have mastered micro hydro technology at the sub-district level, even though its manufacture is straightforward. The technology mastered is a water wheel with a capacity of under 25 kW. Meanwhile, the turbine technology that has been mastered is

the cross-flow turbine type with a capacity of under 100 kW. Microhydro Power Plants have been aimed at remote rural areas in Indonesia. Likewise, biomass has been developed even though it is effortless and has only been used for cooking and lighting.

On the other hand, technological development has yet to adapt to market conditions. Although Indonesia has been able to produce turbines to meet the needs of solar and wind energy, the price is still very high because they can only be produced in a specific size that cannot meet market demand. For example, in providing silica sand to make solar panels, Andika - a member of the Indonesian Renewable Energy Society - said in an interview that Indonesia has quality silica sand. Unfortunately, converting the silica sands into raw material for silicon crystals from metallurgical grade to electronic grade requires significant investments and low energy costs (Andika 2023). To build a solar cell industry, it needs to have a minimum capacity of about 500 megawatts per year to be cost-effective. Although renewable energy consumption in Indonesia is relatively high, its distribution is uneven every year, creating uncertainty for the viability of factories. Therefore, this is one of the reasons why investment in solar energy has yet to develop in Indonesia. According to Widhy (2023), an officer from the Directorate General of New, Renewable Energy and Energy Conservation (Direktorat Jenderal Energi Baru, Terbarukan dan Konservasi Energi/EBTKE), financial conditions that are not bankable also affect the development of renewable energy in Indonesia.

Due to the limitations of renewable energy technology, foreign investment has yet to receive support. Foreign investment in renewable energy in several developing countries, including Indonesia, still needs to be increased (Ialnazov & Keeley, 2020). Renewable energy investment only reached USD 1.12 billion in Q3 2021, which is 55% of the government's target. Meanwhile, investment in battery manufacturing plants and electric vehicle factories only amounts to about USD 2.75 billion combined. Similarly, the oil and gas, coal and mineral, and electricity sectors only reached 54%, 63%, and 43% of the government's targets in the same period. Renewable energy capacity still needs to decarbonize the energy system by 2050 fully. The EISR study shows that in the next ten years, Indonesia needs to increase annual investment ten times greater than the current government target (IESR 2022).

In Indonesia, funding is still a significant issue in the energy transition. During the pandemic, which requires more social funds, funding for the energy transition is marginalized (Adrian et al., 2023). Research states that the energy transition in Indonesia still needs to improve in terms of investment and funding policies. Policies regarding funding and investment in Indonesia's overall energy policy are only 5%. Adrian et al. (2023) have not seen any support for funding and investing in the energy transition in Indonesia. Meanwhile, Resisudarmo Research believes that many policy schemes related to funding have positive support for the energy transition in Indonesia. Transition failure will likely occur because funding and investment policies do not yet favour the energy transition.

On the other hand, investor interest in the renewable energy sector in Indonesia occurs because investors' interests have not been accommodated, such as ensuring security and sustainability of investment, ease through the digitization of licensing processes, ease of setting up a business, tax deductions, and so forth (Putri 2021) and the lack of availability. adequate data (Kalpikajati and Hermawan 2022). Meanwhile, complicated bureaucracy impacts investors' concerns about investing in the EBT sector in Indonesia significantly when regulations often change ((Lauranti & Eka, 2017). Implementation of Minister of Energy and Mineral Resources Regulation No. 50/2017 concerning the Utilization of Renewable Energy Sources for Providing Electricity creates obstacles in the form of the Build, Own, Operate, and Transfer/BOOT scheme, mechanisms in the renewable energy business (Febrianingsih, 2019) and makes renewable energy

generation projects non-bankable or lacks domestic financing support (Simanjuntak 2022) This complexity can be seen in the decline in the realization of renewable energy investment to only 1.51 billion US Dollars from the original target of 2.04 Billion US Dollars throughout 2021 (Guitarra 2022)

In an interview, Abdurrahman (2023), a member of the BPH Migas Committee, stated that the transition to renewable energy cannot be carried out quickly because, until now, there has been no realization of soft loans related to renewable energy. According to him, the funds needed for this transition are quite large, especially related to technology and the ability of renewable energy to replace fossil energy as a whole. Saleh also noted that Indonesia's capabilities in terms of technology and funding for renewable energy projects are still limited.

The Indonesia Sustainable Finance Outlook 2023 report by the Institute for Essential Services Reform (IESR 2023) in October 2022 stated that financial institutions in Indonesia, including the four largest commercial banks, still support fossil energy projects, especially coal, with total funding reaching IDR 216 .6 trillion in the 2016-2020 period. Bank Rakyat Indonesia (BRI) was the largest provider of support, with IDR 98.91 trillion, followed by Bank Mandiri (IDR 83.14 trillion), Bank Negara Indonesia (IDR 30.02 trillion), and Bank Central Asia (BCA) (IDR 4.53 trillion). This situation reflects that the government still financially supports fossil energy.

The government must encourage low-carbon technology, environmentally friendly energy transition, increased energy efficiency, and sustainable development to avoid the backlash of energy consumption and carbon emissions. Coordination between central and regional governments is also needed to formulate fiscal policies that lean towards a low-carbon pathway(Hartono et al. 2021).

Conclusion

The COVID-19 pandemic that has hit the world, including Indonesia, has significantly impacted the energy transition. In several countries, this situation has become a significant momentum for the journey of energy transition from fossil energy to renewable energy. Conditions that force a reduction in fossil energy consumption due to lockdown policies encourage the country to turn its attention to the renewable energy sector. Fluctuating oil prices in the world market further urged the country to optimize industrial policies and renewable energy investments before the COVID-19 pandemic. In fact, during the COVID-19 pandemic, the amount of renewable energy investment has increased in many countries, especially developed countries that see long-term opportunities for renewable energy increasingly real. However, in some developing countries, the transition momentum tends to be momentary or even not at all. Renewable energy policies that tend to occur due to falling fossil energy prices and economic stimulus packages do not necessarily guarantee the transition to renewable energy.

In Indonesia, the energy transition is even more burdened by the COVID-19 pandemic. The condition happens because policies are less favourable to the energy transition. Although Indonesia has stated its commitment to exceed the energy mix by 23% by 2025, the fact is that the policy is not friendly to renewable energy. Long before the COVID-19 pandemic policy occurred, energy policy favoured the coal sector. It is undeniable that this sketch supports the Indonesian economy. In addition to being the country that owns the largest coal deposits in the world, this business has been running for quite a long time. It involves several policymakers involved in the coal business. The

increasing foreign investment support for the coal sector during the pandemic and the unchanged policy of banks in providing soft loans in the coal sector made coal a profitable business. Foreign demand for coal, also increasing during the COVID-19 Pandemic, makes coal an increasingly lucrative business.

On the other hand, renewable energy technology still depends a lot on imports, making renewable energy prices unable to compete with coal prices. The State Electricity Company cannot meet market demand if it utilizes electricity from renewable energy. The price that is still relatively high will be a burden for consumers.

Thus, the Covid 19 Pandemic cannot be an essential momentum for Indonesia in the energy transition because policies on the energy sector before the COVID-19 Pandemic have yet to fully fulfill the intention of fulfilling the 23% energy mix in 2025. Coal still occupies an essential position in the energy sector and community welfare. After the COVID-19 Pandemic, the coal sector is still experiencing increased production and export value. Suppose support for the renewable energy sector, especially in industry and technology development, is carried out after some time. In that case, it will never be able to compete with fossil energy, especially coal. Extensive investment support is needed for Indonesia to develop a large potential for renewable energy.

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