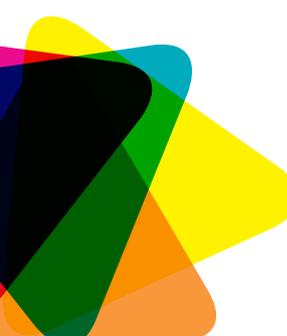


Summary for Policymakers

# Indonesia's Coal Dynamics:

Toward A Just Energy  
Transition





## **COPYRIGHT**

The material in this publication is copyrighted. Content from this paper may be used for non-commercial purposes, provided it is attributed to the source. Enquiries concerning reproduction should be sent to the address:

### **Institute for Essential Services Reform (IESR)**

Jalan Tebet Barat Dalam VIII No. 20 B, Jakarta Selatan, 12810, Indonesia  
www.iesr.or.id | iesr@iesr.or.id

#### *Author:*

Deon Arinaldo (Lead Author)  
Julius Christian Adiatma

#### *Reviewer:*

Erina Mursanti, Fabby Tumiwa, Marlistya Citraningrum (in alphabetical order)

#### *Editor:*

Fabby Tumiwa

## **ACKNOWLEDGMENT**

This paper has been produced as a part of work of Climate Transparency, an international partnership of IESR and 13 other research organizations and NGOs comparing G20 climate action – [www.climate-transparency.org](http://www.climate-transparency.org). The paper is financed by the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) of Germany supports this initiative on the basis of a decision adopted by the German Bundestag.

The authors would like to thank the following people for their constructive comments on earlier drafts: Erina Mursanti, Fabby Tumiwa, and Marlistya Citraningrum (IESR). Gerd Leipold and Hannah Schindler (Climate Transparency Secretariat). Thomas Spencer (TERI). Paola Parra (Climate Analytics). All opinions expressed, as well as omissions and eventual errors are the responsibility of the authors alone.

## **PUBLISHED BY**

Institute for Essential Services Reform (IESR)  
Jakarta, Indonesia  
First Edition. March 2019

## **CONTACT**

Institute for Essential Services Reform (IESR) | Jalan Tebet Barat Dalam VIII No. 20 B |  
Jakarta Selatan 12810 | Indonesia | T: +62 21 2232 3069 | F: +62 21 8317 073 |  
www.iesr.or.id | iesr@iesr.or.id

Cover photo: [www.businesstimes.com.sg](http://www.businesstimes.com.sg)



## Introduction

**T**he economy of Indonesia has shown a significant growth over recent decades. Indonesia is one largest economy in the world with GDP more than 1 trillion dollar, and the largest economy in Southeast Asia. Indonesia economy growth after the economic crisis, moving away from lower income country to middle income countries, with average Gross Domestic Product has reached USD 3500/capita.

Coal is the heart of Indonesia energy policies since late 1970s. Although Indonesia coal reserve is not the largest in the world, the coal endowment in Indonesia is relatively significant compare to other fossil resources. Total coal reserve is 22.6 billion ton or 2.2% of

total global reserve (BP 2018)!<sup>1</sup> Drive by the abundance of this reserve the government has set policy to increase the use of coal for generating electricity as stipulated in the various National Energy Policy (NEP) documents issued since 1980s. In NEP 2014, coal is set to contribute 30% of the total national primary energy mix by 2025 in which the total energy supply is expected to reach 400 million ton oil equivalent (TOE). Not only for the electricity, the government also plans to use coal for substituting oil and LPG to be used for transport and cooking.

---

<sup>1</sup> Ministry of Energy and Mineral Resources (MEMR) claimed that coal reserve reached 37 billion ton and 166 billion ton as resources. This makes the share of Indonesia coal reserve is 3% of global reserve. See: <https://www.esdm.go.id/id/media-center/arsip-berita/rekonsiliasi-data-sumber-daya-batubara-indonesia-kini-166-miliar-ton-cadangan-37-miliar-ton>

## Coal in Electricity Supply

As economy grows, demand for energy increases. Electricity consumption in Indonesia has increased about 26% in the last four years, from 812 kWh per capita in 2014 to 1,021 kWh per capita in 2017. To supply the electricity, Indonesia depends heavily on fossil-fueled power plants. More than 88% of electric power is generated by fossil fuel, about 60% from coal, 22% from natural gas, and 6% from oil, and only 12% of it generated by renewables.

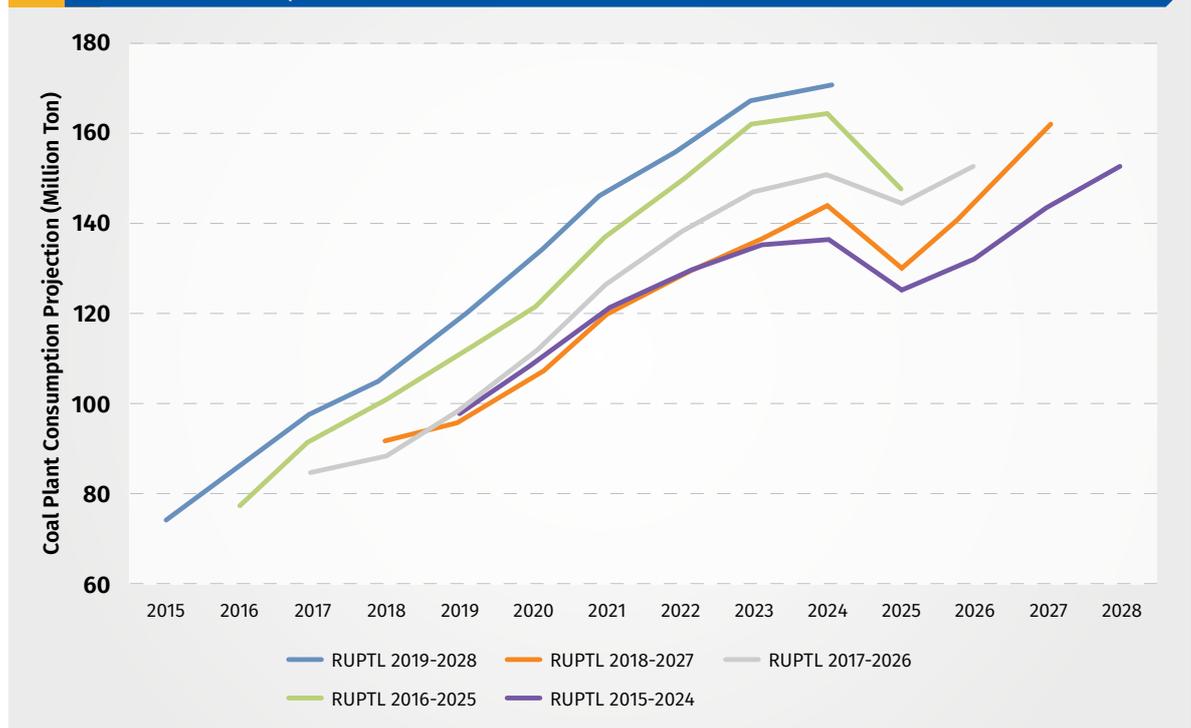
Based upon the latest PLN's Electricity Provision General Plan (RUPTL) issued in February 2019, coal demand for power generation is expected to increase from 90 million ton today to 150-160 million in 2028-2030. The projection is dramatically change in the past four years and this latest number is 25% lower than RUPTL 2015-2024 (see Figure 1). Nonetheless coal grow remains strong in the past decade, as government accelerate coal power development in mid-

2000s through Fast Track Program (FTP) 1 and 2. In 2015, government plans to build 35 GW, in which 22 GW are coal power plants.

Domestic consumption is also expected to rise due to an increase in coal consumption per unit of electricity production. An analysis on PLN's coal-fired power plant statistics shows there is an increase of coal consumption by 44% over the last 15 years (Adiatma et al., 2018). There are two main factors that affecting this increase: firstly, the low efficiency of coal plant fleet, and secondly, the use of lignite that has lower calorific value (<4200 kcal).

The increasing use of coal in power sector also drive by political economy of energy price. Government has intention to keep the electricity affordable for the majority of the population and to keep competitiveness of business and industry. Coal is perceived by policymakers and utility as the cheapest energy source for electricity compares to other fossil fuel and most of renewables. The government argues that large share of coal in the power system could keep the cost of electricity generation lower.

Figure 1. Change in projection of coal consumption for Indonesia power sector (from RUPTL 2015-2019)



Given that Indonesia is coal producer country, government can invoke price-controlled policy for domestic coal to keep PLN's electricity production cost to be as low as possible. After implementing Domestic Market Obligation (DMO) policy in 2011, the Ministry of Energy and Mineral Resources issued a cap for domestic coal price in March 2018. Under this policy, coal producer must sell coal to PLN at a reference price of \$70/ton but depends on the quality of the coal.

## Coal in Indonesia Economy

Coal is not just important resource for generating electricity but also as strategic and top priority export commodity. Indonesia is second largest coal exporter globally and main coal supplier to Asian countries. Revenues from coal is one of source for state budget and expenditure. For the last four years, coal revenue collected is averaging around IDR 31 trillion (2.17 billion USD) or averaging close to 80% of total non-oil & gas revenue. However, coal revenue contribution to the state budget is relatively low, around 1.5 to 2 % of total revenue (Mariatul Aini, 2018).

Mining industries contribute 5-8% of Indonesia GDP in the past 10 years, in which about 80% comes from coal industry. In 2018 the government increase coal production up to above 500 million ton, and allow miners to export coal more. The government's reasoning over the exploitation of coal is to increase trade revenue and help in counterbalancing deficit coming from oil and gas trade (Syahni, 2018)

Indonesia's coal resources and production are mainly distributed over only four provinces out of 34: East Kalimantan,

South Sumatera, South Kalimantan, and Central Kalimantan. Kutai, Tarakan, and Barito coal basins located in East Kalimantan have medium-quality coal (calorific value between 5,100-6,100 kcal/kg) while the Central and South Sumatera Basins have low-quality coal reserves (calorific value <5,100 kcal/kg) (Adiatma et al., 2018).

Coal has a substantial contribution to the local economy of the four provinces. In East Kalimantan, coal sector contributed up to 35% of the provincial GDP in 2017. By adding oil and gas to the figure, the number almost reach half of the provincial GDP. This indicates that East Kalimantan economy relies heavily on fossil fuel. A similar condition can be found in South Kalimantan province. Although South Kalimantan has lower GDP value compared to East Kalimantan, South Kalimantan's coal sector contribution is rather high, ranging between 19-26% of the provincial GDP in the last five years. Considering the high share of GDP from coal sector and also the discrepancy between coal and other sectors' development in both provinces, coal transition may have more impacts on their economics, social, and political environment.

## Coal and Climate Change

This heavily dependence on coal for supply Indonesia energy present and the future cause a number of consequences in the context of rising global earth temperature that cause climate change and local air pollution. Indonesia emission from energy sector is expected to increase three times from 168 million ton CO<sub>2e</sub> to 498 million ton CO<sub>2e</sub> in 2030. In 2014, carbon intensity for power generation was 738 gram CO<sub>2</sub>/kWh, significantly higher than the world average of 567 gram CO<sub>2</sub>/kWh



(ADB, 2018).

Indonesia has committed to reduce 29% of GHG emission from the BAU by 2030, of which 11% of its emission come from energy sector, according to its National Determined Contribution). Without considering external cost of a coal power plant, coal is a cheap source of energy to support Indonesia's economic development. Environmental damage and health issues (especially respiratory diseases) are two significant external costs.

These issues put pressure for Indonesia to transition its energy sector from a carbon intensive fossil-based system to low carbon renewable-based system. It becomes important if Indonesia aims at achieving the climate target. On the other hand, the costs of renewable energy have been declining at unprecedented rates. Once renewables reach grid parity, coal energy would be significantly lessened.

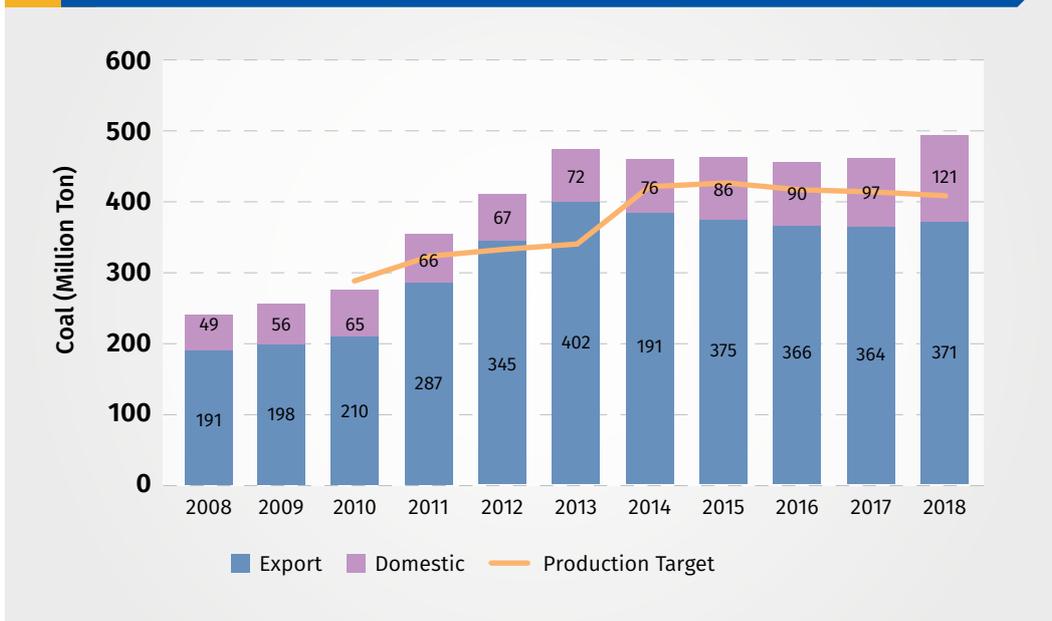
## Key Findings

### **1. Coal sector transition is politically challenging.**

Indonesia's coal industry has a strong ties and alignment with political system at local and national level. The entire supply chain of the industry is a major source of revenues at provincial and district level and contribute to local development. Several political elites in Indonesia also have a close connection with coal mining businesses in the country.

Coal mining has become a political commodity and source of funding for political campaigns at national and local level. Since stakeholders view coal as a trading and political commodity, it is difficult to control its production and export as they benefit from it. Moreover, the coal industry (both in the mining and power sector) is tightly connected to political elites in Indonesia, involving several big names in current national political landscape (including political patrons, parliamentarians, ministers and presidential candidates).

Figure 2. Indonesia Coal Production and Target



Local elites gain even more since the decentralization of mining permit, leading to soaring amount of granted mining permit between 2001 and 2008. In 2001, the number of mines license issued by the central government was ca. 750 and then it increased significantly to over 8,000 licenses by the end of 2008. During 2010 – 2014, close to 3,000 mining licenses were issued, bringing the number to 10,900. From that massive number, 40% is coal mining IUP (Izin Usaha Pertambangan/Mining Business License) with a total area of 16.2 million ha.

The condition above has triggered a boom in coal production. National coal production since 2016 has always been higher than RUEN target. Although RUEN plans to reduce production to 400 million tons by 2019, actual production continues to increase, reaching 557 million tons in 2018. In that same year, the government even allowed miners to increase coal production by more than 100 million ton over Ministry of Energy and Mineral Resources target to compensate for Domestic Market Obligation cap-price policy.

**2. Energy transition is currently underway in some emerging economies. Relying on coal export would put Indonesia's economy at risks, coming from global price fluctuation and demand volatility due to policy changes in major coal export destination countries. Moreover, demand from major coal importer countries is expected to stagnate at best, assuming there is no change in emission standard and Green House Gas emission reduction target in those countries.**

Over 80% of Indonesia's coal production is exported. This puts Indonesia's coal industry susceptible to global coal dynamics. Since China contributes a fair share in international coal demand, the sudden change in coal import figure from China could certainly affect international coal price. The price would have a significant impact on Indonesia's coal mining industry due to Indonesia's relatively low-priced coal. Small scale coal producers will be the most susceptible group affected by this coal price volatility. Historically, this has been proven recently. The decline of global coal prices hitting USD 50/ton in 2015 forced

**Figure 3. Indonesia's Coal Export Destination**



many coal mining companies to cease production.

Moreover, as Indonesia's coal export mainly consists of low-quality and medium-quality steam coal (less than 5,100 kcal/kg and between 5,100 and 6,100 kcal/kg calorific value, respectively), the global coal demand for steam coal will influence Indonesia's coal export dynamics. The global steam coal demand will be affected as major coal export destination countries, such as China, India, Japan, South Korea, Taiwan and Thailand, move forward to phase-out or at least limit newly-built coal power plants. Some countries like China and India also impose a higher standard of emission that leads to the reduction of coal consumption per unit energy generated, a condition that might reduce coal demand in the near future.

Because of this, Indonesia's coal export could decrease by 15.7% by 2023 (IEA, 2018). Moreover, if those countries implement higher standard of GHG emission for coal-fired power plants, it would further jeopardize Indonesia's coal export, since Indonesia's low-quality coal would not be able to cope with the higher standard. In this case, the estimated steam coal export

value could be reduced by 14-72% and coal export volume reduced by 23-84% (estimated from percentage of coal export foreign exchange value from low and medium quality coal in 2018) (Ministry of Trade, 2019).

### 3. Policymakers and utility perceives coal as a cheap energy source to power the country.

This perception sets a major obstacle to advance energy transition in Indonesia's power sector. This, however, does not consider heavy government subsidy and externalities in the coal price. In addition, constant decline of coal power plant efficiency along with declining cost of renewables will make this claim even more questionable in the near future.

A major challenge to energy transition in Indonesia is the fact that coal industry is heavily subsidized. Government subsidizes coal industry through loan guarantee, tax exemption, and preferential royalties and tax rates. Government has also imposed a price cap on coal consumed for power generation, keeping the cost of power generation from coal low against increasing global coal price. On top of that, public also bear environmental and social costs not

included in coal production cost.

Despite being perceived as cheap energy, in actual, the efficiency of coal power plants has been declining in the last decade; probably due to declining efficiency of old coal power plants, lower quality of coal consumed, and poor performance of new coal power plants built by Chinese contractors. This will increase the production cost of coal-based power in the future, putting it uncompetitive to renewables.

Meanwhile, the cost of electricity generation from renewable sources, mainly from solar and wind, has been declining globally as well as in Indonesia, driving the energy transition from coal. Many factors drive the price down, such as economies of scale, improvement in the manufacturing process, and increasing capacity factors. A recent study showed that a potential cost saving of USD 10 billion could be achieved if renewable energy power plants are to be built instead of coal power plants planned under RUPTL 2018-2027.

#### **4. Coal transition is inevitable.**

Timely and right decision from national and local policymakers to prepare for and support coal transition is crucial to avoid a devastating impact during the process. It requires multi-level medium- and long-term planning and collaborative work from multiple sectors, ministries, and local governments.

Coal power plants and coal mining as a business is a long term investment and return. When energy transition from coal to renewables takes place, the already built coal-fired power plants will potentially become stranded assets. Cheap energy production cost from renewable will put coal power as last resort, even more reducing its already low utilization rate. According to Institute for Energy Economics and Financial Analysis projection, based on RUPTL 2017-2026, in Java-Bali only, there will be 5.1 GW of unused coal power plants

capacity that will worth USD 16.2 billion over their 25 years operational lifetime. Research Centre of Climate Change University of Indonesia also estimated there will be at least USD 40 billion total stranded assets in coal mining if there is a shift of total demand and price of coal by 20% from 2014 value.

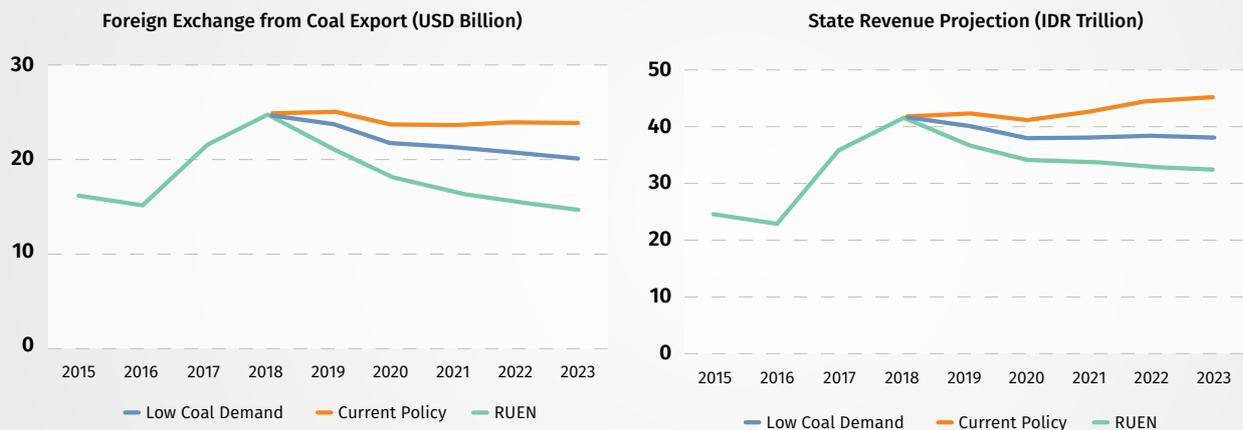
Moreover, the coal transition will also affect Indonesia's economic activity. There are three scenarios used in this study to project the economic impact of the transition: current policy scenario, low demand scenario, and RUEN scenario. The first one will showcase coal demand if current policy in energy sector in both Indonesia and coal export destination countries are carried out as it is. The second one will project coal demand if there is a slight reduction of coal export to China as well as slow growth in power sector in Indonesia. The third one will limit coal production since 2019 as stated in RUEN.

For current policy scenario (for both export and domestic consumption), coal production could reach 550 million tons by 2023. In a more realistic low demand scenario, coal production could reach 450 million tons by 2023. However, if the government complies to the plan stipulated in RUEN, coal production will be maintained at 400 million tons per year.

Each scenario will have different impact on Indonesia's energy sector and economy. Compliance to RUEN's coal production scenario will potentially cut the state revenue by IDR 13 trillion or less than 1% of total state revenue, compared to current policy scenario. The government will also potentially lose USD 9 billion in foreign exchange balance in 2023, equal to the foreign exchange deficit in 2018.

It is expected that employment in upstream coal sector will decrease in all scenarios, due to low growth of lower coal price and increasing labor productivity. Maintaining coal production in line with RUEN scenario instead of increasing coal

**Figure 4. Impact of Different Scenarios to Indonesia's Economy**

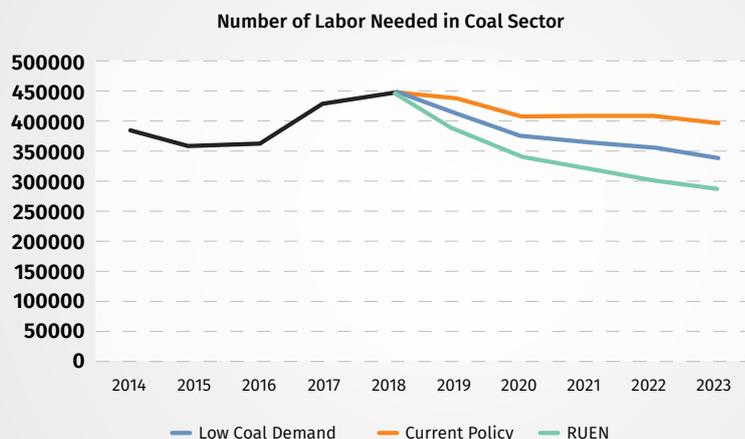


production according to current policy scenario could potentially cost the government about 100,000 of employment in this sector.

All the above-mentioned implications of limiting coal production growth will more severely affect local economy, especially for East Kalimantan province as the largest coal producer. If its economy is to be transformed away from coal, a major slowdown in economic growth and employment rate must be expected, as historical data have shown. This transformation is, however, inevitable, since the coal-based economy will only last a few decades due to resource depletion and environmental commitment.

This province will potentially lose around IDR 250 trillion of Gross Domestic Product (GDP) if RUEN scenario is implemented instead of current policy scenario. If the low demand scenario is to take place, it will lose around IDR 120 trillion of GDP. This gap has to be covered by increase in other sectors. In 2017, mining sector has the highest GDP to labor ratio with IDR 2.39 billion/labor in the province, followed by manufacturing and processing industries with IDR 1.37 billion/labor. Thus, processing industry is the most prospective sector to cover up the declining growth in coal sector. Tourism sector also has potential to generate economic growth since the province is known for its cultural and

**Figure 5. Impact of Different Scenarios to Employment in Coal Sector**



natural heritage. The benefit from current coal-based economy should be allocated to develop the new potential economic drivers and to provide the basis for a just transition.

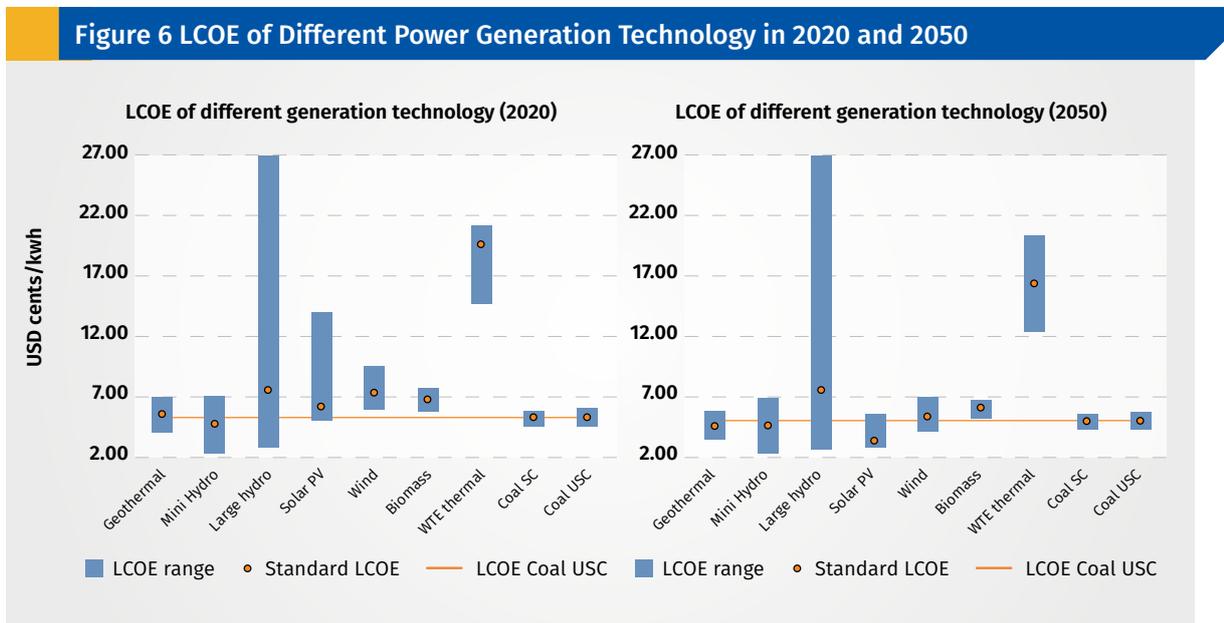
**5. Developing local renewable energy industry would contribute toward coal transition, national energy security, and climate policies.**

Potential benefits that may come with such plan are more employment opportunities, higher economic growth in industry, and also potential reduction in renewables cost in Indonesia. They could lead to cheaper and cleaner electricity that is aligned with public needs and the government policies.

Renewable has become a global trend in the power sector due to its rapid decline in technology cost. Eventually, the same pattern could happen in Indonesia. Indonesia’s energy policy and NDC has already given direction toward the development of

renewables. Therefore, the next step would be creating a conducive environment for renewable industry to grow through favourable regulation and incentives.

The current renewable technology levelized cost of electricity (LCOE) in Indonesia would be comparable with coal by 2030 (for solar and geothermal) and 2050 (for wind). Having established renewable industries in local levels could also possibly drive down the cost of renewables faster. By then, energy transition would happen naturally, limiting the economic incentive needed to support such process. Moreover, the industry would provide the basis for new jobs in Indonesia. IRENA reported that in 2017, 140 GW additional installed capacity has allowed for 500 thousands jobs created in renewable industries (excluding large hydropower). Considering that number, potentials of jobs creation in Indonesia if 35 GW of renewable are to be added in 2025 could reach 100 thousands jobs.





Institute for Essential Services Reform (IESR)  
Jalan Tebet Barat Dalam VIII No. 20 B  
Jakarta Selatan 12810 | Indonesia  
T: +62 21 2232 3069 | F: +62 21 8317 073  
[www.iesr.or.id](http://www.iesr.or.id) | [iesr@iesr.or.id](mailto:iesr@iesr.or.id)

 @IESR  @iesr.id  @IESR.id  @iesr