

**REPORT**  
MAY 2019



**TPSA** | CANADA-INDONESIA TRADE AND  
PRIVATE SECTOR ASSISTANCE PROJECT



# The Increasing Role of Renewable Energy in Indonesia's Electricity Sector

**Canada** 

Program undertaken with the financial support of the Government of Canada provided through Global Affairs Canada

IN PARTNERSHIP WITH



**Glendale Partners**



## **The Increasing Role of Renewable Energy in Indonesia's Electricity Sector**

*Prepared by Glendale Partners*

### **About Glendale Partners**

Glendale Partners was incorporated in Jakarta, Indonesia, in 2004 as an organization dedicated to providing services to the highest international standards for the Indonesian market contributing to the country's economic development and advancement. Glendale acts both as a technical consultant in project feasibility and planning, and preliminary and detail engineering in the resource development area.

### **About the TPSA Project**

The Canada–Indonesia Trade and Private Sector Assistance (TPSA) Project is a five-year, C\$12-million project funded by the Government of Canada through Global Affairs Canada. The project is executed by The Conference Board of Canada, and the primary implementation partner is the Directorate General for National Export Development, Indonesian Ministry of Trade. TPSA is designed to provide training, research, and technical assistance to Indonesian government agencies, the private sector (particularly small and medium-sized enterprises, or SMEs), academics, and civil-society organizations on trade-related information, trade policy analysis, regulatory reforms, and trade and investment promotion by Canadian, Indonesian, and other experts from public and private organizations. The overall objective of TPSA is to support greater sustainable economic growth and reduce poverty in Indonesia through increased trade and trade-enabling investment between Indonesia and Canada. TPSA is intended to increase sustainable and gender-responsive trade and investment opportunities, particularly for Indonesian SMEs, and to increase the use of trade and investment analysis by Indonesian stakeholders for expanded trade and investment partnerships between Indonesia and Canada.

© 2019 TPSA Project

# Contents



<b>Glossary</b> .....	<b>4</b>
<b>Introduction: Renewable Energy and Climate Commitments</b> .....	<b>6</b>
<b>Indonesia's Electricity Sector</b> .....	<b>7</b>
Current and Planned Infrastructure .....	7
Regulation and Policy Stewardships .....	8
Market Structure and Pricing .....	9
IPP Contracts and Financing .....	11
<b>How Renewable Energy Contributes or Can Contribute</b> .....	<b>12</b>
Indonesia's Recent Projects .....	14
Solar Energy .....	14
Waste to Energy .....	14
Biomass .....	15
Ocean Energy .....	15
<b>The Consultations</b> .....	<b>17</b>
Recent Major Studies .....	17
Stakeholder Interviews and Focus Group Discussions .....	18
Stakeholder Issues and Discussion .....	19
Infrastructure and Operations .....	21
Policy and Regulation .....	22
Contractual and Financial .....	23
Markets and Access .....	24
<b>Learnings</b> .....	<b>25</b>
Policy and Regulation .....	25
The Price of Renewable Energy .....	25
Local Content Rules .....	26
Subsidies to PLN and Consumer Pricing .....	26
The Future Role of PLN .....	26
Contractual and Financial .....	27
Conclusion .....	27

# Glossary

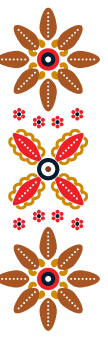


<b>ASEAN</b>	Association of Southeast Asian Nations
<b>BAPPENAS</b>	State Ministry of National Development Planning
<b>BOOT</b>	Build, Own, Operate, Transfer
<b>BPP</b>	<i>Biaya Pokok Produksi</i> (average generation cost of electricity)
<b>BPPT</b>	Agency for the Assessment and Application of Technology
<b>BUMD</b>	<i>Badan Usaha Milik Daerah</i> (Regionally Owned Enterprises)
<b>COP 21</b>	Conference of Parties—21st Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC) held in Paris in December 2015
<b>DPR</b>	<i>Dewan Perwakilan Rakyat</i> , Indonesia's Parliamentary Commission VII on Energy and Mining Within the House of Representatives
<b>DMO</b>	Domestic Market Obligation
<b>FiT</b>	Feed-in-Tariff
<b>FSRU</b>	Floating storage and regasification units
<b>GDP</b>	Gross domestic product
<b>GHG</b>	Greenhouse gas
<b>GOI</b>	Government of Indonesia
<b>GW</b>	Gigawatt
<b>HVDC</b>	High voltage direct current
<b>IEEFA</b>	Institute for Energy Economics and Financial Analysis
<b>IPP</b>	Independent power producer
<b>IRENA</b>	International Renewable Energy Agency
<b>JAMALI</b>	The islands of Java, Madura, and Bali
<b>KEN</b>	<i>Kebijakan Energi Nasional</i> (National Energy Strategy)
<b>kmc</b>	Circuit kilometres
<b>kV</b>	Kilovolt
<b>kVA</b>	Kilo-volt-ampere
<b>kW</b>	Kilowatt
<b>kWh</b>	Kilowatt hour
<b>LCOE</b>	Levelized cost of electricity
<b>LNG</b>	Liquefied natural gas
<b>MEMR</b>	Ministry of Energy and Mineral Resources ( <i>Kementerian Energi dan Sumber Daya Mineral</i> )
<b>MoF</b>	Ministry of Finance
<b>MoT</b>	Ministry of Trade
<b>MW</b>	Megawatt
<b>MWh</b>	Megawatt hour
<b>PLN</b>	<i>PT Perusahaan Listrik Negara</i> (state electricity corporation)
<b>PPA</b>	Power Purchase Agreement
<b>PPU</b>	Private Power Utilities (electricity generated for own use)
<b>PV</b>	Photovoltaic



<b>RE</b>	Renewable energy
<b>RENSTRA KESDM</b>	<i>Rencana Strategis 2015–2019 Kementerian Energi dan Sumberdaya Mineral</i> (2015–2019 Strategic Plan of Ministry of Energy and Mineral Resources)
<b>RUEN</b>	<i>Rencana Umum Energi Nasional</i> (General National Energy Plan)
<b>RUPTL</b>	<i>Rencana Usaha Penyediaan Tenaga Listrik</i> (Electricity Supply Business Plan)
<b>SMEs</b>	Small and medium-sized enterprises
<b>TKDN</b>	<i>Tingkat Komponen Dalam Negeri</i>
<b>TPSA</b>	Canada–Indonesia Trade and Private Sector Assistance Project
<b>TWh</b>	Terawatt hour
<b>VA</b>	Volt-ampere
<b>WtE</b>	Waste to energy





# Introduction: Renewable Energy and Climate Commitments

Indonesia is blessed with an abundance of energy resources, both fossil-derived (coal, oil, and gas)<sup>1</sup> and renewable (hydro, geothermal, solar, biomass, ocean, and wind). However, it is fossil fuels, especially coal and gas, that are used to provide nearly 70 per cent of the electricity produced in Indonesia.

On January 25, 2017, the Indonesian Minister of Energy and Mineral Resources stated: "Indonesia is resolved to increasing its new and renewable energy mix to 23 per cent in 2025 in line with its commitment to reducing its greenhouse gas emissions it had made during the COP 21 conference in Paris in 2015."<sup>2</sup>

This commitment was made as part of a package of measures to tackle climate change and included a target to reduce emissions by 26 per cent by 2020 and 41 per cent if international support is granted. However, in October 2017, this target was revised downwards to 12 per cent in line with an overall reduction in power generation requirement because of a slowdown in economic growth. It is also expected that most of the renewable energy (RE) development will be driven by the private sector.

In the recently published (April 2018) electricity supply business plan for 2018 to 2027 (*Rencana Usaha Penyediaan Tenaga Listrik 2018–2027*, or RUPTL), the proportion of RE in the country's energy mix was re-established at 23 per cent by 2027, with coal accounting for 54.45 per cent and gas 22.2 per cent.<sup>3</sup>

Industry stakeholders are less optimistic than the Minister of Energy and Mineral Resources that the RE target is achievable, or that the progress to date is sufficient. This report summarizes the major issues that stakeholders feel must be addressed. It also reflects Glendale Partners' thoughts regarding priorities, timing, and some of the approaches that have proven useful elsewhere.

---

<sup>1</sup> Although Indonesia is currently a net importer of oil because most of the known oil deposits are too expensive to develop in the current economic climate.

<sup>2</sup> Tempo.co, "Indonesia Poised to Achieve 23 Percent Energy Mix by 2015," January 27, 2017, accessed March 29, 2019, <https://en.tempo.co/read/840258/indonesia-poised-to-achieve-23-percent-energy-mix-by-2025>.

<sup>3</sup> Ministry of Energy and Mineral Resources, *Rencana Usaha Penyediaan Tenaga Listrik 2018–2027*, April 20, 2017, accessed April 1, 2019, [http://djke.esdm.go.id/pdf/RUPTL/Salinan%20Sesuai%20Aslinya\\_Kepmen%20ESDM%20ttg%20Pengesahan%20RUPTL%20PT%20PLN%20\(Persero\)%202018-2027.pdf](http://djke.esdm.go.id/pdf/RUPTL/Salinan%20Sesuai%20Aslinya_Kepmen%20ESDM%20ttg%20Pengesahan%20RUPTL%20PT%20PLN%20(Persero)%202018-2027.pdf).



# Indonesia's Electricity Sector

Indonesia's electricity sector includes several independent transmission grids, numerous generation technologies, and a single government entity (*PT Perusahaan Listrik Negara*, or PLN) that dominates generation capacity, provides all transmission and distribution services, operates the entire system, is responsible for system planning, and implements government policy. Indonesia's geographic diversity and population distribution mean that not all citizens have equal or reliable access to electric power, although the current target is to achieve almost universal access in 2019. Indonesia's current energy policy includes a strong focus on affordable electricity as a key element of standard of living and an enabler of economic growth. Integrating renewable generation into the system requires balancing multiple objectives in the face of multiple constraints.

## Current and Planned Infrastructure

In 2017, Indonesia's total installed power-generating capacity (including captive and off-grid generation) was 59,656 megawatts (MW), of which 41,049 MW (69 per cent) were owned by PLN, 13,781 MW (23 per cent) by Independent Power Producers (IPPs), 2,434 MW (4 per cent) by private power utilities (PPUs), and 2,392 MW (4 per cent) by Non-Oil Operating Licences. Electricity production totalled 290 terawatt hours (TWh) and consumption was 247 TWh, equivalent to 956 kWh per capita, which is well below the neighbouring Association of Southeast Asian Nations (ASEAN) economies.

Access to the grid is mixed. Indonesia is an archipelago and as such the transmission network is not one system but a system of eight interconnected networks and 600 isolated grids. The average electrification ratio across Indonesia is 91.16 per cent but this disguises vast differences between the western and eastern regions, with electrification in the western part of the country as high as 99.98 per cent (DKI Jakarta) and in the eastern part of the country as low as 47.8 per cent (Papua).

The development of renewable resources to supply local grids where available and interconnecting grids where feasible is a priority for PLN. However, for various reasons, several of the generation projects have been delayed. Facing potentially drastic electricity shortages over the medium term, the government introduced a series of fast-track programs to accelerate power generation, but most of these have experienced delays.<sup>4</sup>

Most of Indonesia's electricity production in 2017 was from coal (55 per cent), followed by gas power plants (26 per cent), RE (12 per cent—hydropower 7 per cent and geothermal power 5 per cent), and oil (7 per cent).

PLN currently owns and operates around 49,799 circuit kilometres (kmc) of transmission line. PLN is looking to expand the main grids and is working to develop the grid in Sumatra and to add another 500 kilo-volt-ampere (kVA) link to the Java–Bali grid. The plan is to expand the network to more than 60,000 kmc by 2020.

---

<sup>4</sup> For more detailed information on the status of current and planned infrastructure, see Pradeep Tharakan, *Summary of Indonesia's Energy Sector Assessment* (Manila: Asian Development Bank, 2015), accessed April 1, 2019, <https://www.adb.org/publications/summary-indonesias-energy-sector-assessment>.



RE development in a nation that has primarily coal generation, is geographically diverse, has numerous transmission systems, is sensitive to consumer prices, and is dominated by a single entity presents many challenges. Each must be addressed. There are physical challenges that reflect the intermittent nature of RE, particularly potential mismatches between when the energy is available and when it is needed. RE (with the exception of geothermal and ocean currents) is available to the system based on the particular resource (wind, sunshine hours, tides) and must be stored so that it is available when the market needs the power. The electricity that is available can also increase or decrease rapidly without much notice. This means that the remainder of the system must have resources (reserve generation) that can be controlled to ensure that energy supply and demand balance at all times. Indonesia's existing systems are managed by PLN to ensure that this balance is achieved, and introducing additional generation sources increases the need to anticipate changes in the electricity supply that is introduced to the system.

RE also differs from traditional thermal generation in the timing of its costs. Thermal generation from coal, natural gas, or oil most often has a lower initial capital cost to build the generation capacity and then a higher ongoing operating cost to pay for fuel. Most RE has a higher initial capital cost per unit of capacity, and a much lower ongoing operating cost because it needs no fuel. RE also generates electricity intermittently and is available at a lower average rate than thermal generation. When PLN, or any independent generator, considers the life-cycle cost of energy, timing becomes important. Levelized cost of energy (LCOE) is one of the primary tools used to compare generation options. That measure determines the cost of energy over the life of a generating unit based on the ratio of total discounted costs to total discounted energy generated. Load factor is reflected in the LCOE through the discounted energy generated and the timing of costs and revenues is reflected in the discounting process. Costs that occur during the construction phase receive a higher weighting than costs that occur longer term. Thus, LCOE for RE projects must overcome higher initial capital costs, with longer-term fuel cost savings partially eroded through discounting. The environmental costs of competing generation technologies are not entirely priced into the levelized cost calculation.

Market or grid access is another challenge that independent energy producers, whether renewable or thermal, must face. PLN operates the transmission system and is responsible for delivering electricity where and when it is required. Because there is no competitive market or independent operator, other generators must have a contract to guarantee that their energy will be accepted and that they will receive payment. Whether this is a Power Purchase Agreement (PPA) or a Feed-in-Tariff (FiT) contract, that agreement will set the terms for power sales to the market. To the extent that RE is variable in nature, the terms of the contract must reflect the overall system's ability to accommodate variability. Investors in independent generation will look to the contract to determine the risks they face and the opportunity to generate earnings from a project.

## Regulation and Policy Stewardships

One of the overarching policy objectives is to provide affordable electricity to the people. A second is to achieve 99.9 per cent electrification across the country, including providing power to 10,300 remote villages, by 2019. There is a perceived trade-off between price and energy source diversification. These are two key policy objectives against which the cost of building and integrating additional RE generation capacity must be balanced. The interplay between regulated consumer prices, PLN costs, acquisition prices for electricity from independent producers (including RE), and financial flows between PLN and the Ministry of Finance (MoF) is complex.

The main party responsible for governing the Indonesian energy sector is the **Ministry of Energy and Mineral Resources** (MEMR). MEMR comprises directorates general for oil and gas, electricity, and new and RE and energy conservation, each with its legislated mandate. MEMR also manages the relevant activities of the state-owned utilities and energy service companies and does research that is relevant to Indonesia's mandated energy goals.







The **State Electricity Corporation (PLN)** is the only state-owned power utility company in the country and its only fully integrated power utility company. PLN is the main provider of public electricity and electricity infrastructure in the country (generation, transmission, distribution, and retail sales). PLN is responsible for achieving the Indonesian government's electricity generation targets through the fast-track programs. PLN no longer has a legal monopoly over electricity generation, transmission, and distribution after the passage of the 2009 electricity law (Law 30/2009). However, it does have a right of first refusal over any activity in the electricity sector, which is often a disincentive for private enterprise. PLN plays a key role in planning for generation and transmission additions, in integrating new sources into the transmission system and in contracting with independent power projects. One of PLN's priorities is to keep the purchase cost of electricity to them as low as possible, to minimize the magnitude of subsidies needed from the MoF—subsidies that are needed due to PLN's otherwise negative cash flow situation.

The **president and his office** are generally supportive of RE. The presidency is responsible for defining the National Energy Strategy (*Kebijakan Energi Nasional*, or KEN) and validating the General National Energy Plan (*Rencana Umum Energi Nasional*, or RUEN). The presidency focuses on ensuring affordable energy for citizens and is concerned that renewables could increase costs. Despite the international pledges and commitments to the Paris Agreement at COP 21, the president is heavily constrained at this time and primarily oriented toward the immediate impact on ordinary Indonesians.

The **Indonesian parliament (Dewan Perwakilan Rakyat, or DPR)** has a key role in establishing the legislative framework for RE and approving the budgets for line ministries and PLN. The budgets determine whether the development of RE can occur. While some members of parliament support RE, numerous others are aligned with the fossil fuel industry, particularly coal, and most are extremely sensitive to the price of electricity in their regions. Moreover, it is widely recognized that the in-depth technical knowledge of the majority of members of the DPR is not high—their main knowledge is of the final prices paid by their constituents, not the complexities by which costs and revenues are derived.

Other government ministries and agencies are involved in aspects of the energy sector, including the MoF, the State Ministry of National Development Planning (BAPPENAS), the Ministry of State-Owned Enterprises, and the Ministry of Environment and Forestry. The Coordinating Ministry of Economic Affairs and the Coordinating Ministry for Maritime Affairs also have jurisdiction over energy projects.

The **Ministry of Finance** manages the state budget and plays a key role in establishing what financial support is given to RE sources. Its priority is to ensure that subsidies remain low, which is at odds with added spending on RE. The MoF supports RE technologies, particularly for geothermal energy, through fiscal incentives such as tax policies and financing. The MoF must determine whether to increase payments to PLN to cover greater incentives to RE in the form of, for example, FiTs. The MoF's principal concern is with the health of the sector and must consider PLN's high level of indebtedness and therefore its ability to cover its interest payments.

The need for a paradigm shift in energy policy for the country—to provide sufficient power to meet GDP growth projections and meet its national and international commitments to the expansion of RE and a reduction of greenhouse gas (GHG) emissions by 2025—is recognized by all stakeholders from both the public and private sectors. However, stakeholders have different views on how the shift can be accomplished.

## Market Structure and Pricing

The Government of Indonesia (GOI) regulates consumer prices for electricity. These prices are set annually with the objective of maintaining purchasing power for its citizens. PLN's operating revenues depend directly on consumer prices. At this time, consumer prices are set below cost, and PLN's operating revenues are insufficient to cover its costs. As PLN operating revenues are not sufficient for full cost recovery, the





government provides a payment to PLN from the national budget. The amount is calculated to cover all of PLN's costs plus a margin of 7 per cent. This is effectively a cost-plus arrangement with little incentive for PLN to control costs and increase operational efficiency. Until recently, all classes of customers were subsidized and it was the practice of the government to subsidize PLN as whole rather than a class of consumer. However, the subsidy was withdrawn from households with larger connections and, in 2017, the government withdrew electricity subsidies from households with 900 volt-ampere (VA) connections. The government did provide an exemption for the poor.

The government has been looking at methods to reduce the cost of this pricing mechanism. However, the government has recently changed priorities and is determined to maintain the consumers' purchasing power in the run-up to the national elections in 2019 and as such, no changes to the electricity tariff are expected until after the elections. Instead, the government has invoked its right to levy a Domestic Market Obligation (DMO) on coal producers and is looking to keep costs down by purchasing fuel at around \$30 a ton less than current market value for thermal coal.

In Indonesia, tariffs for RE are based on the region (PLN *Wilayah*) and reflect the current cost of production of electricity in the given *Wilayah*, commonly referred to by its Indonesian acronym BPP (*Biaya Pokok Produksi*). BPP represents the cost to PLN of obtaining power from the various systems and sub-systems listed in the applicable BPP Decree. The cost to PLN of acquiring power is a mixture of the costs of generating the power through its own power generation plants, and the cost of purchasing power from third-party suppliers such as IPPs and power rental companies.<sup>5</sup>

The Indonesian government has set tariff ceilings for both coal-fired projects and RE projects based on the applicable BPP at the time. The RE's FiT (except for geothermal, hydro, and municipal waste) is 85 per cent of BPP, if the local production cost is higher than the national average production cost. If the local production cost is the same or lower than the national average production cost, then the FiT will be 100 per cent of the local production cost or based on mutual agreement between PLN and IPP. In East Indonesia where there is still a reasonable portion of power being generated by diesel, the rate is higher. In areas where the mix is more coal-based, the tariff rates are lower and RE is not really feasible.

Under applicable regulations, the MEMR is required annually to publish the BPP numbers for the areas and systems across the country. The MEMR recently issued 2017 BPP Decree (Decree No. 1772 K/20/MEM/2018) which, with effect from April 1, 2018, supersedes the 2016 BPP Decree (Decree No. 1404 K/20/MEM/2017).

The national average BPP increased to US¢7.66/kWh or Rp1,025/kWh, approximately a 4 per cent increase on last year, and was caused by the increase of the primary energy price for coal, gas, and oil-based fuel between 2016 and 2017, as well as the weakening exchange rate of the Indonesian Rupiah to the U.S. dollar. The government is now looking to cap the price on primary energy for electricity for public use. MEMR Decree No. 1395 K/30/MEM/2018 caps coal prices for public interest electricity supply.<sup>6</sup>

The BPP is set with a view only to production costs and reflects the financial state of PLN, which the government supports by covering its operational losses. However, as the coal price or oil price rises, which is the current trend, then the costs of fossil fuel electricity continue to rise. As the government's current policy is to maintain consumers' spending power, the fuel price increases are being covered by the government, either through a commitment to increase subsidies or through the use of the DMO in the case of the coal.

---

<sup>5</sup> Baker McKenzie, "Indonesian Government Publishes 2017 Cost of Generation (BPP) Figures," April 2018, accessed March 20, 2019, [https://www.bakermckenzie.com/-/media/files/insight/publications/2018/04/al\\_jakarta\\_indonesiangovcostofgeneration\\_apr18.pdf?la=en](https://www.bakermckenzie.com/-/media/files/insight/publications/2018/04/al_jakarta_indonesiangovcostofgeneration_apr18.pdf?la=en).

<sup>6</sup> Ibid.



This means that the rising costs of fossil power will not in the short term increase the competitiveness of RE, as the government is absorbing these costs instead of passing them onto consumers. Given the upcoming national and regional elections in 2019 and the political importance of the government maintaining the current level of prices for electricity, the status quo is assured for the near term until the new government is established. Even then, it is unlikely that any significant increases in the costs of electricity generation, transmission, and distribution would be passed on to the consumer since “affordable” electricity, along with security of supply, are the two main drivers of the government’s energy policy and likely to remain so for the next decade, at least while Indonesia continues to industrialize and coal provides the means to achieve this.

## IPP Contracts and Financing

The framework in which independent power projects are negotiated and financed is a final aspect of the existing industry structure. PLN acts as the primary power generator in Indonesia and operates the transmission grids. PLN also has the best understanding of electricity markets and is responsible for planning both generation and transmission additions to meet market demand and to accomplish the country’s electrification targets. As the system operator, PLN is responsible for ensuring that electricity is available to customers when they need it and must schedule all generators to ensure that supply exactly meets demand. This scheduling responsibility includes determining which generators are supplying electricity to each grid throughout the day, and determining whether additional units are dispatched to stand ready to provide additional electricity should it be required to meet unexpected demand surges, unplanned generator outages, etc.

Any power generation above a relatively small capacity requires a contract with PLN to be eligible to supply electricity to any of its transmission or distribution systems. As part of the contract, PLN can set technical requirements to ensure that the IPP power functions properly and does not disrupt operations. This is important because electricity flows instantaneously and must be properly managed to ensure system reliability. In addition to technical considerations, PLN acts as the counterparty to IPP contracts. This means that PLN represents the electricity system and fulfills its contractual obligations to receive electric energy, integrate that energy into its deliveries to consumers, receive payment for the electricity, and remit payment to the IPP. The contract may be in the general form of an IPP contract, or in a more specialized form of FiT contract. The main contract terms would relate to its term, payment obligations, price adjustment, termination rights, etc. The precise structure of these contracts determines the risk allocation between the independent producer and PLN. For example, the contract will specify conditions under which the IPP is not required to supply power, or PLN is not required to receive power. An unexpected failure of the generator or the transmission system might make it impossible for the power to change hands. In this case, the contract might excuse the failure, or it might impose a financial penalty. The specific remedy influences the risks allocated to each party. A contract that specifies the conditions under which PLN is required to receive power from the IPP and pay for the power presents less risk to the IPP and more risk to PLN than one that does not have a take or pay clause.

A key element for any independent generator to proceed with project implementation is the ability to finance the project. Such projects are typically financed with 70 per cent or more debt, placing significant risks on the lenders. Both the equity holder and the lender will rely primarily on some measure of return on investment, such as the LCOE, compared with the projected electricity price. However, the specifics of the contract and its risk allocation play a key role in obtaining finance.

Indonesia faces the challenge of ensuring that the requirements of IPPs, lenders, and project proponents are carefully balanced to ensure that RE projects are cost effective.



# How Renewable Energy Contributes or Can Contribute

RE will play a key role in reducing Indonesia's GHG emissions while the economy and electricity demand continue to grow. The stated goal of 23 per cent renewable generation by 2027 presents a formidable challenge, as described above. However, Indonesia is well blessed with vast resources of both fossil and non-fossil (renewable)-based sources of energy for the production of electricity, fundamental for development. Even allowing for certain renewable sources that are located in non-economically feasible locations, the total RE reserves are, with the exception of wind, very large. (See Table 1.)

**TABLE 1**

## RENEWABLE ENERGY RESOURCES IN INDONESIA (GIGAWATTS)

Renewable energy form	Total resource (GW)	Developed to date (GW)
Hydro (large)	75	5
Hydro (small and micro)	19	
Bio-related	33	1.7
Geothermal	29	1.4
Ocean	18	Three micro projects under development
Wind	.06	0.08
Solar	207	0.003

Sources: RENSTRA KESDM 2015–2019<sup>7</sup>; RUPTL 2018–2027.<sup>8</sup>

The current long-term plan (RUPTL 2018–2027) places a strong reliance on expanding the role of RE as electricity demand continues to grow.<sup>9</sup> As of June 2018, the installed RE generation capacity was 6,513.3 MW, or 11.68 per cent of the total capacity. A further 2,921 MW were under construction. Table 2 compares the fuel mix for 2018 to that projected for 2025. As indicated, the shares of coal and natural

<sup>7</sup> Indonesia Ministry of Energy and Mineral Resources, *Rencana Strategis 2015–2019 Kementerian Energi dan Sumberdaya Mineral* (2015–2019 Strategic Plan of Ministry of Energy and Mineral Resources), May 31, 2015, accessed April 2, 2019, [https://www.esdm.go.id/assets/media/content/Renstra\\_KESDM\\_2015-2019-Buku\\_Ringkasan.pdf](https://www.esdm.go.id/assets/media/content/Renstra_KESDM_2015-2019-Buku_Ringkasan.pdf), and RUPTL, 2018–2027.

<sup>8</sup> Ministry of Energy and Mineral Resources, *Rencana Usaha Penyediaan Tenaga Listrik 2018–2027*, April 20, 2017, accessed April 1, 2019, [http://djke.esdm.go.id/pdf/RUPTL/Salinan%20Sesuai%20Aslinya\\_Kepmen%20ESDM%20ttg%20Pengesahan%20RUPTL%20PT%20PLN%20\(Persero\)%202018-2027.pdf](http://djke.esdm.go.id/pdf/RUPTL/Salinan%20Sesuai%20Aslinya_Kepmen%20ESDM%20ttg%20Pengesahan%20RUPTL%20PT%20PLN%20(Persero)%202018-2027.pdf).

<sup>9</sup> The data for the 2018 RUPTL used in this report are from the RE development plan presented by an official from PLN at the Japan–Indonesia Business Forum for Energy Efficiency, Conservation, and Renewable Energy, Hotel Indonesia Kempinski, Jakarta, November 14, 2018.



gas are expected to decline. Among RE sources, geothermal and hydropower are expected to show the strongest growth.

**TABLE 2**

**FUEL MIX PROJECTION IN 2018 RUPTL**

Fuel	2018 share (per cent)	2025 share (per cent)
Coal	62	54
Natural gas	14	9
Hydro	7	10
LNG	7	13
Geothermal	5	12
Other renewables	0	1
Oil	4	1
Imports	1	0

Source: RUPTL 2018–2027.

The anticipated time path for RE capacity additions by energy form is shown in Table 3. These numbers suggest that almost half of the new capacity will be added in a single year (2025) in the form of large-scale hydropower and geothermal projects.

**TABLE 3**

**RENEWABLE ENERGY DEVELOPMENT PLAN (MW/YEAR)**

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Total
Geothermal	210	150	221	235	405	445	355	2,537	20	5	4,583
Hydro	66	287	193	755	315	196	635	4,461	n.a.	564	7,472
Mini-hydro	108	202	366	103	31	n.a.	n.a.	n.a.	n.a.	n.a.	811
Solar	5	22	214	281	n.a.	200	n.a.	325	n.a.	n.a.	1,047
Wind	70	60	5	45	10	30	309	n.a.	n.a.	60	589
Biomass/ Waste	53	53	41	19	235	n.a.	n.a.	n.a.	n.a.	10	411
Ocean	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Total	512	774	1,040	1,438	996	871	1,296	7,323	20	639	14,912

n.a. = not available

Source: RUPTL 2018–2027.



In addition, the capacity additions are planned to be unevenly distributed between PLN's planning regions. Table 4 shows the already developed western and central regions will receive most of the incremental capacity.

**TABLE 4**

**REGIONAL RENEWABLE ENERGY CAPACITY ADDITIONS, 2018–2027**

Region	Capacity additions (MW)
Sumatera	5,533.6
Jawa Timur, Bali dan Nusa Tenggara	2,352.3
Jawa Bagian Barat	360.7
Jawa Bagian Tengah	4,387.6
Kalimantan	370.1
Sulawesi	1,726.5
Maluku Papua	180.4

Source: RUPTL 2018–2027.

## Indonesia's Recent Projects

Indonesia has been investing in RE, although perhaps not at the optimal pace. The remainder of this section summarizes some of the recent projects and their status.

### Solar Energy

Compared with other countries in the world, Indonesia has very favourable potential PV power generation. In addition, the seasonal variability in the country is low compared with other regions further from the equator. Nevertheless, solar energy development in Indonesia is still slow, consisting of stand-alone solar photovoltaic (PV) systems in remote areas. Some on-grid larger capacity has been installed in Kupang, East Nusa Tenggara. However, the lack of stability of the local grid network in the area resulted in the failure of the solar input because the system was installed without an inverter.

The very limited level of solar investment in Indonesia is due mainly to frequent changes in policy to support RE energy uptake, such as the FiT rate combined with high local content requirements that limit access to the most-efficient technologies.

### Waste to Energy

In Indonesia, energy derived from biomass and biofuels is the third-largest component of the RE mix after hydro and geothermal. As of June 2014, Indonesia had a total of 93.5 MW installed capacity of waste to energy (WtE), with a pipeline of projects in different preparation phases together amounting to another 373 MW of capacity, giving a total capacity of 466.5 MW, approximately 5 per cent of the potential in Indonesia.

The Agency for the Assessment and Application of Technology (BPPT), a government research institute, plans to build 10 WtE plants in Indonesia's main cities, including at Bantar Gebang, in Bekasi, West Java, the major landfill site for Jakarta's 7,000 tons of daily solid waste. The city is also planning an Intermediate Treatment Facility for solid waste in Sunter, North Jakarta, which is expected to be able to treat 2,200 of



the 7,000 tons of solid waste produced by the city per day, and produce around 40 MW of electricity using WtE technology.

Unfortunately, the joint venture between the Finnish energy company Fortum and city-owned developer PT Jakarta Propertindo (Jakpro), which had signed a deal to develop and operate the technology, has encountered a major obstacle to project progress. Both companies had agreed on the business scheme in which Jakpro would hold 51 per cent of the shares while Fortum would hold the remaining 49 per cent.

However, the proposed scheme may not be applied following the issuance of Government Regulation No. 54/2017 on BUMD (*Badan Usaha Milik Daerah*, or Regionally Owned Enterprises), which requires the city-owned company to own at least 70 per cent of the shares in the subsidiary company. If investors are allowed only 30 per cent of shares instead of the usual 49 per cent, this would act as a disincentive to invest. A much-needed WtE project of national importance, worth US\$210 million, is thus on hold until the regulation is reviewed. Fortum has asked for legal certainty concerning the development of the facility; numerous complications have left the project in limbo for some time.<sup>10</sup>

### Biomass

A biomass scheme producing 10 MW of electricity from sustainably harvested King Grass and Elephant Grass as primary fuel grown on degraded land in Konawe District, Southeast Sulawesi Province, was proposed in 2013 under the sobriquet "Home Grown Electricity in Rural Indonesia." Using specially designed and proven boilers to handle the cellulose-rich feedstock, combined with a Siemen's condenser steam turbine, the plant would provide a 10-MW renewable, carbon neutral, and ecologically responsible power solution. In addition, the project would provide many new jobs in areas where unemployment is endemic and act as a catalyst to general economic development in the area. Unfortunately, financing and permitting issues prevented the project being established, although the concept has much merit and could be replicated throughout Indonesia in rural areas where there is a modest demand for electricity and a renewable option makes economic and environmental sense.

### Ocean Energy

Wave power is different from tidal power; the latter captures the energy of the current caused by the gravitational pull of the sun and moon. Waves and tides are also not the same as ocean currents, which are caused by forces such as breaking waves and wind. Wave-power generation is not a widely used commercial technology, although a few first-generation prototypes have been tested. With the issue of climate change, there is a growing global interest in RE, including wave energy. However, given the amount of research required and costs involved, its application potential in Indonesia is extremely low.

**Tidal power** or **tidal energy** is a form of hydropower that converts the energy generated from tides into power, mainly electricity. Tidal energy, while not yet broadly used, has future potential, as tides are more predictable than the wind. Tidal energy is relatively costly and there are limited sites with suitably high tidal ranges or flow velocities.

**Ocean currents** flow in complex patterns, largely driven by wind and the heating of surface waters near the equator by the sun. Ocean currents are relatively constant and generally flow in one direction (although some currents, such as those around the Shetland Isles, are two-way), in contrast to tidal currents along the shore.

Indonesia is home to the world's largest ocean current, the Indonesian Throughflow, which has an estimated volume of between 20 and 22 Sverdrups, with one Sverdrup equivalent to 1 million cubic

---

<sup>10</sup> Callistasia Anggun Wijaya, "Legal Certainty Key to ITF Development," *Jakarta Post*, April 18, 2018, accessed April 1, 2019, <https://www.thejakartapost.com/news/2018/04/18/legal-certainty-key-itf-development.html>.





metres of water per second (1Mm<sup>3</sup>/s). Of the many straits in eastern Indonesia or the Lesser Sunda Islands through which this massive volume of water flows, the 35-kilometre-wide Lombok Strait offers the most direct path to the Indian Ocean and it is estimated that about 20 per cent of the shallow water flow of the Indonesian Throughflow passes through this conduit. With such an enormous and constant flow of water, the potential for harnessing its energy is huge, and Indonesia is at the forefront of Asian countries in attempting to produce electrical power from ocean energy. An example is the Nautilus marine energy project in Lombok.<sup>11</sup>

A Scottish company, Nova Solutions, which has successfully carried out small-size ocean energy installations in the Shetland Isles, using up to 1 MW turbines, is engaged in undertaking its first project in East Indonesia and in discussion for follow-up projects. Unfortunately, the legal uncertainty surrounding the sector and BPP maximum tariff at US¢20/kWh is still proving uneconomic for the Scottish companies and the projects are currently on hold.

In 2018, the Indonesian government, in alliance with the Dutch government, approved a plan to build what has been called the world's largest tidal power facility in Flores. The new plant, known as the Palmerah Tidal Bridge, will be built into a floating 800-metre-long bridge on the Larantuka Strait in East Flores, one of the straits through which branches of the Indonesian Throughflow pass en route from the Pacific to the Indian Ocean. The plant plans to produce between 18 and 23 MW of power, providing electricity for 100,000 people in the area. A second phase of construction would see capacity increased to between 9 and 150 MW, enough power for more than 500,000 people in the region that largely relies currently on expensive and often old and unreliable polluting diesel generators for electricity.

**Hybrid systems.** Over the past two years, there have been various discussions on using hybrid arrangements, particularly with solar and for remoter areas. Hybrid in this sense means tying in a renewable form of energy to an existing diesel generation plant, many of these being spread across the archipelago, although many of the plants are old and in poor condition. The supply of diesel to these plants by PLN and Pertamina (an Indonesian state-owned oil and natural gas corporation based in Jakarta) is, in many cases, both insufficient and erratic.

There are several advantages to the use of hybrid systems. They can be added to existing diesel-generating capacity, thus reducing fossil fuel consumption. These systems can also deal with the variability of power supply as the diesel systems provide base load when the RE part of the system is unable to carry the load. In addition, hybrid systems are not covered by the current MEMR pricing regulations, which gives more flexibility when negotiating a deal. They are also less disruptive to the current way in which electricity is provided in remote areas.

There are excellent solutions already prepared that would link up workable units with solar, which would vastly reduce the reliance on diesel supply and be able to provide 24/7 access to electricity. While solar solutions have been the focus to date, because of their versatility, availability, and quick installation, the approach can also be applied to other renewable forms of energy, where suitable. So far, PLN has not been enthusiastic, as these solutions are seen as breaking the current "affordable electricity supply" mantra.

---

<sup>11</sup> Gregory B. Poindexter, "US\$750 Million Marine Energy Project Moves Forward in Indonesia," *HydroReview*, October 9, 2017, accessed April 2, 2019, <https://www.hydroworld.com/articles/2017/10/us-750-million-marine-energy-project-moves-forward-in-indonesia.html>.





# The Consultations

The main purpose of this study was to reach out to stakeholders to gather their views on actions that could contribute to reaching Indonesia's RE goal. The outreach included three components: a brief literature survey, interviews, and two focus group sessions.

## Recent Major Studies

The energy market in Indonesia both for fossil fuel and RE has been the focus of several recent studies, with the following two of particular importance and relevance to the current study:

- *Missing the 23 Per Cent Target: Roadblocks to the Development of Renewable Energy in Indonesia*<sup>12</sup>
- *Powering the Nation: Indonesian Power Industry Survey 2017*<sup>13</sup>

The first study used a political economy analysis to identify the role of stakeholders in policy-making and the factors shaping the sector. This analysis, carried out through structured interviews, first gathered data on the current challenges facing the sector. It then shared stakeholder views on why RE development has been limited, the future outlook for RE, and what actions should be taken.

The purpose of the second study, which surveyed the whole Indonesia power industry, was to help inform Indonesia's public and private sectors, as well as others abroad, about Indonesia's power industry and to highlight some of the challenges the country faces in attracting optimal investment and achieving its full potential. This survey included a questionnaire and some structured interviews, with the main stakeholders in the public and private power sectors.

As a result of these and similar studies of the Indonesian power industry conducted over the past decade, the major constraints and issues surrounding the universal supply of affordable electricity in the world's largest archipelago and fourth most populous nation are well documented and understood.

Often referred to as the energy trilemma, "the trade-off between the three objectives of security of supply, affordability, and sustainability has long been recognized as a central issue for energy policy."<sup>14</sup> The most secure energy source may not be the most affordable or the most sustainable. The reverse is true as well. As the World Energy Council points out, "delivering policies which simultaneously address energy security, universal access to affordable energy services, and environmentally sensitive production and use of energy is one of the most formidable challenges facing government and industry."<sup>15</sup>

Energy efficiency and RE are the main pillars of a strategy to transform energy generation to help meet the COP 21 commitments. For the world to meet the goals set out in the COP 21 agreement, RE needs to be scaled up at least six times faster than at present. While different paths can mitigate climate change, RE and energy efficiency provide the optimal pathway to deliver the majority of the emission cuts needed at the necessary speed. Together, they can provide over 90 per cent of the energy-related carbon

---

<sup>12</sup> Richard Bridle and others, *Missing the 23 Per Cent Target: Roadblocks to the Development of Renewable Energy in Indonesia* (Winnipeg: International Institute for Sustainable Development, February 2018), accessed March 28, 2019, <https://www.iisd.org/sites/default/files/publications/roadblocks-indonesia-renewable-energy.pdf>.

<sup>13</sup> PwC Indonesia, *Powering the Nation: Indonesian Power Industry Survey 2017* (n.p.: PwC, May 2017), accessed March 27, 2019, <https://www.pwc.com/id/en/energy-utilities-mining/assets/power/power-survey-2017.pdf>.

<sup>14</sup> Ibid.

<sup>15</sup> World Energy Council, "Trilemma Champion Steps Down After Five Years at the Helm," January 24, 2017, accessed March 26, 2019, <https://www.worldenergy.org/news-and-media/news/trilemma-champion-steps-down-after-five-years-at-the-helm/>.



dioxide emission reductions that are required, using technologies that are safe, reliable, affordable, and widely available.

## Stakeholder Interviews and Focus Group Discussions

The questionnaire and interviews with key stakeholders were designed to provide ideas on how the development of solar, biomass, and ocean energy can proceed within the current political, regulatory, and economic framework. Changes in the regulatory framework that might facilitate an expanded uptake of RE and the removal or circumvention of other obstacles, especially for the three priority modes, were discussed at focus group discussions.

The Canada–Indonesia Trade and Private Sector Assistance Project (TPSA) questionnaire consists of 10 questions on the status of RE in Indonesia that were put to the interviewees. (See “TPSA Questionnaire.”) Although all interviewees provided candid and comprehensive answers for the most part, the detailed responses are not included in this report to protect confidentiality. Given the political reality of the government’s promise of affordable electricity with no price increases in power at least until after the elections and the establishment of a new government in 2020, the main aim of the discussions was to seek avenues for improving the regulatory environment for RE that would have a chance of succeeding in the short term. The remainder of this section is organized according to the issues raised through the interviews and focus groups. For many of the issues, numerous stakeholders participated in the discussion.

### **TPSA QUESTIONNAIRE**

---

1. Why does one of the countries with the most abundant RE sources in the world and one of the highest-stated international commitments to their use not meeting its targets or even coming close?
2. What do you consider the three major roadblocks to successful uptake of RE in Indonesia?
3. The price of energy is a key economic yardstick and therefore of great political importance to be used as a bargaining chip during local, regional, and national elections—do you believe this is true, and in the current climate is it a major factor in the slow expansion of RE?
4. The costs of RE are coming down dramatically worldwide, especially for solar, but in Indonesia cannot compete with coal because coal is subsidized. Subsidies distort the market, as the government appreciated when it reduced the fuel subsidies by US\$700 million at the beginning of Pak Jokowi’s presidency in 2014. Is there a plan to phase out the coal subsidy over the next 10 years?
5. Most G20 countries use the LCOE when comparing production costs per Kwh between competing power generation methods, since this takes into account the costs over the lifetime of the plant in which the free “feedstock” enjoyed by RE is offset against the general capital and operations and management costs. If the lifetime costs are taken into account, then the competitiveness of RE is improving against fossil fuel plants, such as coal, oil, and gas in which feedstock costs are increasing and will never be “free.” Why does Indonesia not use this approach when calculating the feed-in tariffs for RE?
6. For Indonesia to meet its energy commitments between now and 2027, it will need the involvement of the private sectors as IPPs, especially in the development of RE. Do you consider the current regulatory framework to be conducive/attractive to private sector investors in RE? Reasonably attractive? Or not attractive/negative?
7. What do you see as the main constraints to private sector investment in RE? Please rank the following: terms, conditions, regulations, BPP relating to IPPs continually changing; GOI/PLN





adverse to investors making a profit; with Build-Own-Operate-Transfer (BOOT)<sup>16</sup> no terminal value to a project; free feedstock not factored into long-term financial and economic viability of RE projects; hard to compete with subsidized fossil fuels, especially coal.

8. Local content changes according to local government regulations; for example, BUMDs now need to own at least 70 per cent of the shares in a joint venture with a foreign investor, up from the 51 per cent previously. No foreign investor in high-tech RE technology would be willing to own only 30 per cent of the project, as the recent problem with the Sunter 2,200 tonnes-per-day solid waste incinerator developed by the Finnish energy company Fortum has demonstrated. How would you resolve this problem?
9. The broad responsibility and power of PLN present a number of conflicts of interest. For example, PLN's role as fuel supplier to diesel generators means it will lose revenue if remote diesel generators are replaced by, say solar power. PLN owns and operates most fossil fuel generation capacity and has a vested interest in maintaining the status quo to avoid abandoned assets as well as to maintain revenue streams. How can the role of PLN be adjusted to ensure the expansion of RE to the level mandated by the government (i.e., 23 per cent of the energy mix by 2027)? How to ensure that appropriate RE technologies are matched to regional requirements (e.g., the use of solar in the islands of Eastern Indonesia)? And that the current conflicts of interest are avoided?
10. Does the overall structure and remit of PLN need to change? For example, should it be broken up into regional entities that represent the major power usage centres (Java, Bali, Sumatra, East Kalimantan) as opposed to central and eastern Indonesia where power requirements in the scattered islands are much less and where renewables could provide probably 70 per cent of the power requirements?

## Stakeholder Issues and Discussion

The stakeholder consultations provided a rich discussion that covered a broad range of perceptions regarding Indonesia's RE progress. The specific views of individual stakeholders are not presented here. The goal of this project was to identify key themes and receive general input from stakeholders. The issues raised have been organized by theme and are summarized in Table 5. The issues are discussed by category following the table.

**TABLE 5**

### ISSUES AND CONCERNS RAISED BY STAKEHOLDERS

Category	Issue	Brief description
Infrastructure and operations	Grid diversity	There are numerous small grids with limited capacity. This makes integration of renewables challenging.
	Land availability	There is little or no land available for RE projects near major population centres. This makes grid connection more costly.

<sup>16</sup> BOOT is a type of project financing in which a private organization receives a contract from a public sector partner to develop a large public infrastructure project. At the end of the contract period (usually long term), the developer transfers ownership to the public sector partner. WhatIs.com, "BOOT (Build, Own, Operate and Transfer)," last modified December 2009, accessed March 26, 2019, <https://whatis.techtarget.com/definition/BOOT-build-own-operate-and-transfer>.



Policy and regulation	PLN subsidy	There is a broad perception that the government's financial support of PLN represents a subsidy that makes RE uncompetitive.
	Coal subsidy	Subsidies to coal producers are passed through to PLN, making RE less competitive.
	Policy uncertainty	Frequent changes in policy and regulation are a barrier to investments that must take a long-term view of profitability.
	Lack of commitment	Stakeholders believe that government agents, including PLN, are not committed to RE. This results in lack of focus on renewable projects, challenges negotiating contracts, etc.
	Affordable energy policies	The overarching policy commitment to affordable electricity for everyone constrains the ability to commit to RE development for fear it will increase costs.
	Environmental externalities not priced	For both PLN and independents, the analysis that underpins generation investment ignores the environmental impacts of different technologies. This is perceived as a barrier for RE.
	PPA or FIT prices too low	The commitment to 85 per cent of BPP for some regions and even 100 per cent for others creates a very low price ceiling for renewable generators to meet.
	Local content rules	The requirement for minimum local content is seen as increasing costs. There is also concern that some participants are acting to circumvent the rules.
	PLN role	As the main generator and only transmitter and distributor of electricity, PLN operates almost all of the system. Some stakeholders support redefining PLN's role, suggesting that it will make RE more viable.





Contractual and financial	PPAs hard to negotiate	Some stakeholders link their challenges negotiating PPAs to the dominant role of PLN. There are differing views on the issue of how hard it is to finance a RE project.
	Issues valuing renewable energy	Some stakeholders are concerned that LCOE may not be used in planning capacity additions. Specifically, they are concerned that RE assessments do not reflect the advantage of no fuel cost.
	Parallel generator tariff	Independent generators above 200 kW must pay a parallel generator fee to PLN. This increases their cost.
	Terminal value of assets	Under the current BOOT contractual structure, components of the project receive no value consideration at the time of transfer to PLN. This hurts their financeability.
	Profit motive	Some stakeholders feel that the government and PLN do not wish to see them make a profit.
Markets and access	Reserve margins	Many regions of Indonesia face low reserve margins. Because peak generating capacity is not much higher than peak demand, this creates an incentive to direct generation investments toward thermal technologies (coal, natural gas, or diesel).

Source: Glendale Partners' compilation.

### Infrastructure and Operations

Two main factors are often put forward to explain the lack of RE deployment. The first is that there are numerous small grids with limited capacity scattered over 13,000 islands. This makes it impossible for Indonesia to achieve what many other countries have—that is, a single national grid connecting all communities. The second factor is that there is little or no land available for RE projects near major population centres. The result is that there will likely continue to be the need to operate a series of large and small grids in addition to off-grid systems.<sup>17</sup>

Indonesia does benefit from favourable solar resources right across the country. However, it is not competitive with grid electricity when the costs of providing energy storage from solar PV is taken into account.<sup>18</sup> The cost gap is narrowing as electricity storage technologies improve, but will not be closed in the near or medium term.

However, it should be noted that given the current state of energy storage technology, the need for base-load power cannot be eliminated. Battery storage technology is improving greatly but until at least one week's power supply can be stored, the requirement for immediate access to base load will remain for those periods when the sun is not shining or the wind is not blowing. In Java, Bali, and Madura, home to

<sup>17</sup> Richard Bridle and others, *Missing the 23 Per Cent Target: Roadblocks to the Development of Renewable Energy in Indonesia* (Winnipeg: International Institute for Sustainable Development, February 2018), 5, accessed March 28, 2019, <https://www.iisd.org/sites/default/files/publications/roadblocks-indonesia-renewable-energy.pdf>.

<sup>18</sup> Ibid, 5.





the country's main electricity grid, fossil fuels will continue to provide the majority of the base load for the foreseeable future, including the spinning capacity for solar and wind plants.

The specific issue of land availability was raised in the context of land for RE projects near major electricity demand centres. This creates a competitiveness challenge when combined with the current policy requiring RE projects to pay the cost of connecting to the grid. Every jurisdiction handles this issue based on its own circumstances, and the policy adopted influences the economic viability of RE projects. The variable nature of renewable electricity amplifies the costs because the full cost of connection must be spread over a smaller amount of electric energy delivered to the grid. Some jurisdictions require the independent producer to pay the cost, some require the grid operator to pay, and some develop gathering lines regionally based on demand growth and available RE projects.<sup>19</sup> Stakeholder feedback was that PLN should be responsible for grid connection costs.

### Policy and Regulation

More than half of the issues listed in Table 5 relate to energy policy or regulation. This should be a concern for Indonesia because privately financed RE projects have long paybacks. Investors and lenders seek a clearly defined, easily understood set of policies that are not often revised.

A recent study by the U.S.-based Institute for Energy Economics and Financial Analysis (IEEFA) maintains that PLN is "sinking under the weight of a flawed planning process," with insufficient revenue to offset its huge operating costs—these costs have averaged US\$2.1 billion over the past four years.<sup>20</sup> IEEFA has also been critical of Indonesia's coal-based power strategy, noting that it risked wasting US\$25 billion over the next quarter century if it did not follow the world trend of moving to smaller plants and renewable options.

It is estimated that PLN would have lost US\$2.3 billion in 2016 and US\$1.47 billion in 2017 without government subsidies. Instead, with the aid of government assistance that has averaged US\$4.7 billion since 2013, it was able to record profits of US\$591 million in 2016 and US\$321 million in 2017.

However, the discussion of subsidies to PLN is more complex than that. The need for treasury support is linked directly to the overall policy goals of protecting consumers from electricity price increases and expanding access to electricity to all residents. The former means that PLN does not determine the prices it charges consumers, and that retail prices have been set independent of actual cost. To the extent that the subsidy results from prices set below market, it is not so much a subsidy to PLN as a subsidy to consumers. To the extent the subsidy results from a lack of need for PLN to operate efficiently, it may be more appropriately viewed as a subsidy. The electrification goal might also be creating a situation in which generation and transmission infrastructure that would not be economically sound is being built in order to supply electricity to all. In this case as well, the subsidy is more from Indonesia to its people rather than to PLN.

The government has also recently capped the domestic coal price for power stations under the DMO regulation at US\$70 a ton until 2020, 30 per cent below the world market price. Coal represents around

---

<sup>19</sup> According to the policy outlined in the investment law, for investments that take place wholly within a city or district boundary, governance is overseen by the city or district. If an investment crosses two city or district boundaries, then governance floats up to the provincial level. If two or more provincial boundaries are crossed by an investment, responsibility floats up to the national level. There have also been attempts to further regulate land acquisition for infrastructure projects. Global Business Guide Indonesia, "Indonesia's Land Acquisition Laws: on Paper Only?," 2019, accessed March 28, 2019, [http://www.gbgingonesia.com/en/property/article/2016/indonesia\\_s\\_land\\_acquisition\\_laws\\_on\\_paper\\_only\\_11365.php](http://www.gbgingonesia.com/en/property/article/2016/indonesia_s_land_acquisition_laws_on_paper_only_11365.php).

<sup>20</sup> Melissa Brown, *Perusahaan Listrik Negara (PLN): A Power Company Out of Step With Global Trends* (Cleveland: Institute for Energy Economics and Financial Analysis, April 2018), 3, accessed March 20, 2019, [http://ieefa.org/wp-content/uploads/2018/04/PLN-A-Power-Company-out-of-Step-With-Global-Trends\\_April-2018.pdf](http://ieefa.org/wp-content/uploads/2018/04/PLN-A-Power-Company-out-of-Step-With-Global-Trends_April-2018.pdf).





55 per cent of Indonesia's total power capacity.<sup>21</sup> Indonesia is the fifth-largest coal producer in the world and the second-largest coal exporter, with coal contributing positively to the state's budget in the form of royalties—giving the industry power within the policy arena. While the industry is being challenged by falling world demand and environmental concerns, government subsidization of the industry has forced RE to compete against an artificially lowered average cost of electricity.

The majority of the respondents in the structured questionnaires and focus discussion groups carried out in the surveys cited earlier listed a lack of policy stability, difficulties in the negotiation of PPAs, and other regulatory issues, such as the local content requirements, as the main hurdles stopping the development of RE projects.

The focus group participants convened for this report recognized that a paradigm shift was required in Indonesia's national energy policy and structure if the country is to meet its economic and sustainable development goals; its commitment to provide electricity to all its citizens in sufficient quantity and with sufficient reliability to enable sustainable advances in economic and social well-being; and its international RE and GHG emissions' reduction targets and to power the country's economic development and both attain and justify its position as the world's fifth-largest economy by 2050.

This would probably involve reframing the roles and structure of PLN, but such major issues were very much longer term. A number of suggestions were tabled, such as dividing PLN according to function—generation, transmission, and distribution, as well as establishing regional entities that catered to the very different demand, demographic, and geographic realities of the islands, especially in eastern Indonesia.

There were also a number of smaller issues around permits and approvals. There are opportunities to consider a more streamlined approach to issuing site development permits as part of RE project development.

### Contractual and Financial

The stakeholder consultations resulted in several barrier issues and some suggestions for improvement, ranging from high-level concerns to very specific contractual details. The specific terms of PPAs or FiT contracts play a large role in determining whether RE projects can proceed. Stakeholders identified the difficulty of negotiating contracts with PLN as one barrier. On a related theme, some stakeholders expressed the view that the government and PLN are reluctant to see IPPs motivated by profits. Such issues relate as much to policy development as they do to contract negotiations, but to the extent that they hamper contracts from being signed, there is room for improvement.

One part of the focus group discussions was opened from the floor, with a suggestion that a big opportunity for solar rooftop power, especially for industry, could be realized if Regulation 1/2017, which limits independent power production to 200 kW without effective PLN sanction, could be modified.<sup>22</sup> As it stands, the fines paid to PLN for production over 200 kW combined with the short allowed duration of solar (four hours) makes it uneconomic. MEMR and PLN are in discussion, but each blames the other for the regulation since there was little or no dialogue during the framing of the regulation and none with the private sector investors. A coordinated and streamlined one-shot approach could make a difference. This is in line with the stated government policy of accelerating the use of solar rooftop power, although the focus is on household rather than industrial users for the moment.

---

<sup>21</sup> Richard Bridle and others, *Missing the 23 Per Cent Target: Roadblocks to the Development of Renewable Energy in Indonesia* (Winnipeg: International Institute for Sustainable Development, February 2018), 17, accessed March 28, 2019, <https://www.iisd.org/sites/default/files/publications/roadblocks-indonesia-renewable-energy.pdf>.

<sup>22</sup> Independent producers that do not have contracts with PLN are allowed access to the transmission grid. However, if their capacity exceeds a very small limit of 200 kW, they are required to pay a parallel producer tariff. The suggestion is that the tariff exemption threshold be increased.



Other contractual barriers were cited. The valuation of RE is one such item that has been discussed above. This relates to the use or non-use of long-term measures, such as LCOE and the lack of attention to environmental externalities.

One very detailed point was raised that relates to the transfer of projects under BOOT contracts. Current practice is to exclude the value of the land a project occupies at the end of the service life in the total value being transferred to PLN. This issue is more complex than it appears on the surface, given that the land value might be influenced by remediation costs that are difficult to estimate when the contract is being negotiated.

Additional specific items were raised:

- the need to allow power prices to escalate with inflation over the life of a project
- more flexibility in the currency in which a project is financed
- requirements for PLN to pay for contracted electricity even when it can't take delivery
- standardized contracts for RE projects

### Markets and Access

The stakeholder discussions generated only one concern that fits directly into this category. PLN's planning process is strongly focused on expanding access to power and on ensuring system reliability. This introduces the perception that PLN chooses RE projects regionally and grants market access based on how RE projects support their objectives. For example, a solar project in a region that faces a tight reserve margin (peak demand is very close to peak generating capacity) might be encouraged where peak demand coincides with peak generation from solar energy. Conversely, an RE project that exacerbates existing peak energy shortfalls might not be considered.





# Learnings



The stakeholder consultations undertaken for this project have generated a familiar to-do list for Indonesia. (See Table 5.) Other studies have generated similar lists. Indonesia's energy and electricity policies target a complex set of policy objectives that must be balanced:

- Keep electricity prices low to improve the standard of living of citizens and encourage economic growth for industries
- Extend access to electricity to all citizens
- Improve the share of RE in the total generation mix

The interplay of these objectives varies between and within regions. The practicality of RE development also varies. Large, populated regions with a strong and stable electricity generation and transmission system might find it easier to integrate large-scale RE projects, although these regions are currently served by inexpensive coal generation. This makes for stiffer competition for RE projects. More remote regions with limited electric infrastructure, which generally use expensive diesel-based generators, will find different reasons to add RE via hybrid systems or grid-independent installations. Here the cost of power is higher, making RE projects more competitive on a price basis. Policies, regulations, and investments must be tailored regionally to succeed.

The consultations identified numerous areas for improvement.

Any framework to encourage and implement positive change in the investment climate for RE in Indonesia needs, above all else, to be a realistic model for effecting change over a defined time scale and has a good chance of succeeding. To achieve success, the road map must:

- identify the major constraints
- rank them in impact or importance
- categorize them as short-, medium- or long-term constraints based on the current economic and political reality
- provide recommendations and solutions for implementation in the various time frames

The stakeholders focused most of their suggestions on two main areas from Table 5: policy and regulation; and contractual and financial terms. In both areas, the input includes both near- and long-term opportunities to improve Indonesia's investment climate for RE. Many of the suggestions will require further dialogue and in-depth analysis.

## Policy and Regulation

Indonesia's focus on affordable electricity for all includes RE. Prices will remain low, access to electricity will rise toward 100 per cent, and renewable generation will increase its share of the market. Yet there are stakeholder concerns about below-market prices, subsidies to PLN and to coal producers, and RE FiT prices being too low. This complex knot needs to be untied.

### The Price of Renewable Energy

In the near term, stakeholders suggested raising the price paid for RE to 100 per cent of the BPP for all regions and all RE generation technologies. They also recommended either increasing the capacity threshold for the parallel producer charge, or eliminating it altogether. Both of these actions are administrative changes that would increase the economic viability of RE projects. However, they would



come at a cost to PLN, which brings the subsidy payments into the discussion. The challenge is to increase the revenues offered to RE without putting consumer prices at risk.

The increased cost to PLN might create a backlash for RE producers. With the FIT price below the BPP, there is a financial incentive for PLN to increase RE purchases. With the FIT price at the average cost of existing generation, that incentive is gone.

From a policy perspective, this is a relatively simple question. The need is to balance the goal of increasing RE against that of protecting consumers from price increases. This question is not unique to Indonesia. Other jurisdictions have chosen to set their RE expansion goals based in part on the price impact on consumers. They compare the expected cost of expanding thermal generation to that of greater reliance on RE, including the cost of grid expansion and system reserve expansion. These costs are then measured against the price increase that they would impose on consumers. A maximum price impact helps determine how much RE is practical. It also allows policy-makers to send a clear signal to the market and to project developers. Many international jurisdictions have accomplished this planning over a brief period.

### Local Content Rules

Local content rules and the pricing of environmental externalities are not simple themes. Local content requirements have been used elsewhere to encourage the development of local businesses. However, they often result in efforts to circumvent or challenge the definition of local content. They have also resulted in challenges under trade agreements. This is likely a short-term issue to ensure that the rules are working and being properly implemented. It is a medium-term issue to determine whether they are achieving their goal. Environmental externalities present another complex opportunity. Many nations are now pricing carbon emissions. Other harmful environmental impacts, such as sulfur emissions that cause acid rain, are addressed through direct regulation. The gold standard in this area is a careful life-cycle analysis and valuation of all environmental impacts of each generation technology. The results could then be included in planning valuations. This gold standard is not being applied.

### Subsidies to PLN and Consumer Pricing

The subsidy question is even more challenging because it requires a more fundamental re-thinking. Indonesia's current practice is to subsidize electricity consumers indirectly through payments to PLN and regulated coal prices. Although other nations have chosen a similar path, the subsidy chain is inefficient. Consumers are not directly aware of the full cost of the electricity they consume, hence their incentive to be efficient is weakened. Because PLN receives the difference between its revenues and costs as a transfer from the treasury, its incentive to minimize costs and maximize efficiency is weakened. And with RE paid a percentage of the average generation cost (which doesn't depend directly on the subsidy), the impact of changing the subsidy structure on FIT prices is unclear. This is a challenging discussion that will require a strong commitment from the policy team. It will also require extensive communications with stakeholders and consumers. This report has identified what others have said—action is required and will not be simple. The challenge is to find a pricing structure for Indonesia's future economy.

### The Future Role of PLN

The final policy theme is the largest and most complex: reconciling or perhaps redefining the many roles of PLN. Stakeholders agreed on the necessity. However, a discussion this complex might need to be unpacked before it can progress. For example, the role of system operator is often modified when independent generators are added to the system, whether they are RE or not. PLN is responsible for managing Indonesia's electricity networks, and that is a complex task. Certainty regarding the rules for





access, as well as an expectation that the rules will remain for the life of a project, is important to RE projects. Other jurisdictions have made this a priority as part of their RE programs.<sup>23</sup>

Planning for system growth is also a PLN role. Stakeholders challenged government and PLN commitment to RE. In the near term, better communication of how the planning decisions are made and what criteria drive RE goals will help. In the longer term, there may be opportunities for tighter limits on coal or natural gas capacity additions.

Additionally, PLN plays a key role as the counterparty to IPP contracts. It negotiates the contracts, receives the electricity, manages it through the grid, and settles payments. PLN is a natural fit for this role.

## Contractual and Financial

Stakeholders identified a range of issues related to financing and contracting for RE projects, some of which are simple investigations. For example, the impact that the terminal value of land has on the value or financeability of a project can be investigated and resolved as required. Similarly, the use of LCOE in generation planning appears to be less than perfectly understood. Some form of life-cycle comparison of the costs of generation technologies is part of the planning process. What measure PLN uses and how it influences decisions can be communicated so the project developers know what parameters matter. This would also help stakeholders to better understand PLN's commitment to RE. The parallel generator tariff is another example. If PLN is basing the tariff on its actual cost of providing back-up generation for the periods when RE is not available, then the tariff might make more sense. Or if the tariff reflects additional costs to the transmission system from accommodating the additional variable energy, then that explanation might help position the tariff. Perhaps these explanations already exist and are just not communicated.

The perception that PPAs are difficult to negotiate is more challenging. Contract negotiations require parties to define the essence of an agreement, and to find terms that work for all parties. When one party has a more powerful position in the negotiation than the other, that balance is harder to find. This is often the case for PPAs. An independent producer needs to negotiate access to a system operated by a powerful organization. Some jurisdictions approach this through standard contracts. Others impose complex market rules, then allow the parties to find the terms that fit. The stakeholder consultations did not extend to finding a solution, although they did indicate a desire for improvement.

## Conclusion

Indonesia is working to increase its reliance on RE while protecting consumers from price pressures. Indonesia continues to transition from a single entity providing electricity to all consumers to integrating multiple electricity producers into a complex infrastructure that serves diverse markets.

The consultations for this project point clearly to a desire to improve, but that is true everywhere. Specific issues were raised relating to the full range of challenges and opportunities, from contract terms to industry structure and policy directions. This report has attempted to categorize the issues and point to pathways for near-term and longer-term improvement. The results are not proscriptive. However, they do identify opportunities to improve.

---

<sup>23</sup> Virtually all North American jurisdictions (states or provinces) have undertaken extensive stakeholder consultations to design access rules that work. These rules are regularly reviewed and updated as required. The process is different where there is a competitive market for electricity, but there is always a process. In Canada, Alberta and Ontario both have an independent system operator and the rules are public.





**TPSA** | CANADA-INDONESIA TRADE AND  
PRIVATE SECTOR ASSISTANCE PROJECT

Canada Centre, World Trade Centre 5, 15th Floor  
Jl. Jend. Sudirman Kav 29-31 Jakarta 12190, Indonesia  
P: +62-21-5296-0376 or +62-21-5296-0389  
F: +62-21-5296-0385  
E: [greg@tpsaproject.com](mailto:greg@tpsaproject.com)

**[TPSAPROJECT.COM](http://TPSAPROJECT.COM)**