SECTOR ASSESSMENT (SUMMARY): ENERGY[1]

1. Sector Performance, Problems, and Opportunities

1. Indonesia grew with at a steady economic growth rate, averaging 5.0% per year during 2011−2019; and despite contracting in 2020, the economy is forecast to pick up to 5.3% in 2021. Indonesia expects to expand its electricity generation capacity from 56.5 gigawatts (GW) in 2018 to 112.2 GW by 2028, as envisioned in the government's Electricity Power Supply Business Plan (*Rencana Usaha Penyediaan Tenaga Listrik* [RUPTL]), 2019–2028.[2] Electricity demand is expected to increase from 232,296 gigawatt-hours (GWh) in 2018 to 432,713 GWh by 2028. At the same time, Indonesia is transitioning from being an energy exporter that subsidizes domestic energy prices to a country that must import a significant amount of its energy needs at global market prices. It is also seeking to replace its prime exports—bulk commodities—with manufacturing products and services. The government recognizes that achievement of its economic growth goals depends on Indonesia harnessing sufficient sustainable energy sources, a process that began with the launch of various energy reforms during 2014–2018; these are expected to continue under the current cabinet of ministers.

2. **Primary energy.** In 2018, Indonesia's primary energy demand increased by 4.9%, well ahead of the 10-year average annual growth rate of 2.8% from 2007 to 2017. In 2018, total primary energy production stood at 481 million tons of oil equivalent (mtoe) while total domestic primary energy supply amounted to 224 mtoe.[3] Indonesia enjoys an abundance of nearly every form of energy. Estimates put its coal resources at 151.4 billion tons, proven oil reserves at 3.15 billion barrels, and proven natural gas reserves at 96.06 trillion cubic feet (footnote 3). The country boasts the world's largest potential geothermal energy resources, at 25.4 GW; hydropower potential of 75 GW; solar potential of 532.6 GW; biomass and biogas potential of 49.8 GW; wind of 113.5 GW; and ocean of 4,600 GW.[4] However, nearly every energy subsector faces constraints. Oil drove economic growth for many years but slowing domestic production and rising demand made the country a net importer in 2004. Indonesia remains a net exporter of gas, but investment is lagging despite its large proven reserves, slowed by high export obligations, a history of fossil fuel subsidies, an uncertain regulatory framework that discourages private sector investment, and the high cost of infrastructure to connect production to consumption centers. In its expansion plans the State Electricity Corporation (Perusahaan Listrik Negara [PLN]) continues to rely on coal for base load, but also signals a shift towards natural gas, which will enhance the ability of the various grid networks to absorb and expand the use of intermittent renewable energy sources.

3. Efforts to increase renewable energy use have been constrained by inefficient sector policies, implementation challenges, lack of capacity, grid constraints, environmental issues, permitting delays, and a history of low energy pricing. Despite studies indicating potential for achieving energy savings of 10%–35%, consumers rarely adopt energy efficiency measures because of relatively low energy pricing, and insufficient and poorly enforced energy conservation guidelines. This is expected to change as the government continues to work on its targets for renewable energy and energy efficiency as per the National Energy Plan (*Rencana Umum Energi*

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[1] This summary is based on Government of Indonesia, Ministry of National Development Planning (BAPPENAS). 2020. *Independent Assessment of Indonesia's Energy Infrastructure Sector*. Jakarta.

[2] Government of Indonesia, State Electricity Corporation (PLN). 2019. *Electricity Power Supply Business Plan, 2019–2028*. Jakarta.

[3] Government of Indonesia, Ministry of Energy and Mineral Resources. 2019. *2018 Handbook of Energy and Economic Statistics of Indonesia.* Jakarta.

[4] International Renewable Energy Agency. 2017. *Renewable Energy Prospects: Indonesia*. Abu Dhabi

Nasional [RUEN]), 2017, which could increase the viability of conservation measures.[5] The government has prioritized electricity access by adding generation capacity and expanding power grids to raise the national electrification ratio from 89% in 2016 to a target of near 100% by 2024 (footnote 5). Meanwhile many of those with electricity access still suffer from unreliable services, particularly in the remote eastern parts of the country. Independent studies have found that customers in regions outside Java have experienced a higher unavailability of power delivered by the grid than expressed by the utility-reported metrics.[6]

4. **Sector structure.** The government's National Energy Council (Dewan Energi Nasional) sets the overarching goals and policies for the energy sector. The Ministry of Energy and Mineral Resources is the primary government body responsible for regulating and governing Indonesia's energy sector. Other government agencies involved in energy projects are the Ministry of Finance (MOF), the National Development Planning Agency, the Ministry of State-Owned Enterprises, and the Ministry of Environment and Forestry. Local governments play a large role in project implementation, mostly through permits and land acquisition processes that often lead to unpredictable project delays. State-owned enterprises are charged with achieving state-mandated energy goals, which subjects many of these enterprises to the influence of multiple government ministries, such as MOF and the Ministry of State-Owned Enterprises. PLN, the only state-owned power utility company in Indonesia, is the major provider of all public electricity infrastructure in the country and is responsible for the generation, transmission, distribution, and retail sale of electricity.[7] Other key state-owned enterprises in the energy sector include Pertamina, Perusahaan Gas Negara, Geo Dipa Energi, and Pertamina Geothermal Energy.

5. **Power generation**. As of 2018, Indonesia's total power generation capacity (including captive and off-grid generation) was about 56.5 GW, of which 40.5 GW was owned by PLN and the rest procured by PLN from contracted independent power producers. Annual electricity production in 2018 was 283,815 GWh, an increase from 254,404 GWh in 2017, with most electricity (59.6%) produced from coal, followed by natural gas (22.5%), hydropower (6.2%), fuel oil (5.8%), geothermal (5.3%), and other sources (0.6%) (footnote 3). The islands of Bali, Java, and Madura together account for about two-thirds of power generation capacity and over 70% of electricity production. The next largest system is on the island of Sumatra, followed by Kalimantan, and Sulawesi. The rest of PLN's generating capacity is spread across 600 isolated systems in areas with generally low but rising electricity demand. The government introduced a series of fast-track generation programs in 2015 aimed at having PLN and private sector participants bring 42.5 GW of generation on-line.[8] Coal-fired power dominates these plans, but geothermal, hydropower, and other renewables are also included. PLN faced a 15% decrease in electricity demand in 2020 due to COVID-19, however the demand is expected to bounce back as Indonesia returns to pre-COVID-19 economic growth levels in 2021.

6. **Distribution.** PLN owns and operates 52,605 circuit-kilometers of transmission lines and 127,539 megavolt-amperes of transformer capacity, spread across eight networks and 600 isolated grids. Transmission and distribution losses are reasonable considering the geographical

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[5] Dewan Energi Nasional. 2017. *National Energy Master Plan (RUEN).* Jakarta

[6] Kunaifi & Angèle Reinders, 2018. "Perceived and Reported Reliability of the Electricity Supply at Three Urban Locations in Indonesia," Energies, MDPI, Open Access Journal, vol. 11(1), pages 1-27, January.

[7] An electricity law passed in 2002 to unbundle and privatize PLN was annulled by a landmark ruling by the Constitutional Court in 2004. The government has since taken a phased and incremental approach to increasing private sector participation in the power and energy supply chains.

[8] This amount represents the additional generation targeted by three successive fast-track programs. The most ambitious of these, launched in 2015, aimed to add 35 GW of power by 2019, which has since been extended due to slower growth in gross domestic product and power demand. The RUPTL 2019–2028 aims to add 56 GW by 2028.

breadth of Indonesia, with total loss of 8.8% in 2017, consisting of transmission losses of 2.4% and distribution losses of 6.4%. Plans to extend Indonesia's transmission network by 2020 will depend on reducing bottlenecks, identifying financing, and obtaining the approvals for rights-of-way and substations. The distribution network has begun to deteriorate, and regular overloading and unreliable supply now affect several high-density areas.

7. **Pricing and subsidies.** The government provides a subsidy to PLN to compensate for the company's inability to recover its costs through the consumer tariffs set by the government. The government is transitioning to economic regulation for PLN, with a focus on improving financial and operational performance.[9] During 2014–2015, the new administration embarked on reforms by removing subsidies on gasoline, raising diesel prices, and removing power tariff subsidies while instituting an automatic price adjustment for all but a few electricity consumer categories. The electricity subsidy for the remaining households has been phased out, except for the poorest households, as classified in the government's integrated social safety net database. As of February 2019, the electricity tariff for unsubsidized households was Rp1,467.28 ($0.10) per kilowatt-hour. PLN now uses prepaid digital meters for all new residential customers, which helps keep commercial losses low.

8. **State Electricity Corporation's financial capacity.** Because PLN is a state-owned monopoly, the government is closely involved in its budgeting and capital expenditure planning, and in coordinating generation fuel supply. The government has also supported PLN by making capital investments through guarantees, converting debt to equity, and restructuring its debt. These arrangements are unlikely to meet the energy sector's medium-term financial demands under the accelerated generation programs. For the 2019–2028 period, PLN estimates a total nominal capital expenditure for power plants required at $70 billion, which far exceeds PLN's past capital expenditures. PLN has also outlined its major projects, financing needs and support required from the government, development partners, and capital markets in the latest Medium-Term National Development Plan (Rencana Pembangunan Jangka Menengah Nasional [RPJMN]) period of 2020–2024.[10]

2. Government's Sector Strategy

9. Indonesia's broad development goals are outlined in its National Long-Term Development Plan (*Rencana Pembangunan Jangka Panjang Nasional*), 2005–2025.[11] This plan is further divided into four 5-year phases, each with a medium-term plan (RPJMN). Long-term goals for the energy sector, in particular, are outlined in the National Energy Policy (*Kebijakan Energi Nasional*) and the national energy plan (RUEN), which emphasizes resource diversification, environmental sustainability, and maximized use of domestic resources.[12] The policy targets an energy mix by 2025 of oil (25%), gas (22%), coal (30%), and new and renewable energy (23%).[13] Long-term goals for the electricity subsector are in the government's national electricity plan, with the specific investment plan—outlined in PLN's rolling RUPTLs—updated annually.

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[9] The Ministry of Energy and Mineral Resources issued an improved quarterly tariff adjustment mechanism in 2019 and applied the first adjustment for the period October-December 2020. The new adjustment mechanism should lead to tariff increases post pandemic. The Ministry of Finance has also implemented procedures for the provision of the electricity subsidy linked to specific performance indicators for network losses and power plant fuel consumption efficiency to decrease PLN's cost base and rationalize subsidy payments.

[10] Government of Indonesia. 2020. *National Medium-Term Development Plan 2020-2024.* Jakarta.

[11] Government of Indonesia. 2005. *National Long-Term Development Plan, 2005–2025*. Jakarta.

[12] Government of Indonesia. 2014. *National Energy Policy, 2014–2050*. Jakarta.

[13] Increased renewables will help the government achieve its emission reduction targets as stipulated in Indonesia's Nationally Determined Contribution to the Paris Agreement of 2015.

10. Since 2015, the government has initiated several reforms and programs that aim to (i) improve sector governance, and expand energy production through greater private sector investment and more effective public sector investment; (ii) increase the country's use of domestic gas; (iii) expand renewable energy generation and energy efficiency investments; and (iv) expand access to modern energy for all Indonesians. A particular focus has been on reaching remote areas of the archipelago, especially in the eastern part of Indonesia, where energy access rates are lowest and where renewable energy options are often the most economically viable.

3. ADB Sector Experience and Assistance Program

11. Overall, ADB's energy sector plans in Indonesia are designed to support the development of high quality infrastructure, which falls under one of three strategic pathways in its country partnership strategy, 2020– 2024 for Indonesia.[14] ADB's engagement in the sector will continue to be centered on (i) knowledge and institutional capacity; (ii) improved policy and mainstreaming of best practices; and (iii) the financing of energy infrastructure, primarily for power generation through nonsovereign operations, and grid extension and small power generation in remote areas that are commercially challenging through sovereign operations. Since 1970, the Asian Development Bank (ADB) has financed 38 projects and programs with total lending of $5.5 billion for Indonesia's energy sector. With few exceptions, completed loan projects have delivered their expected outputs and achieved their immediate objectives.

12. Since 2010, ADB has supported the government in its energy reform efforts through a range of technical assistance activities focused on (i) a reduction in subsidies in favor of cost-recovery tariffs for fuels and electricity; (ii) price incentives for geothermal, wind, and solar energy; (iii) energy efficiency-related policies and programs, including support for energy service companies and appliance standards; (iv) gas sector reform; (v) least-cost electrification planning to support the national electrification program; and (vi) pilot testing of carbon capture and storage. ADB helped the government identify and set energy sector priorities in the latest medium-term national development plan (2020–2024) through the energy sector white paper as well as other targeted assistance on energy efficiency, renewable energy, and access to electricity.[15]

13. The government has sought increased financing for energy infrastructure development since 2015. By using a direct lending modality with a sovereign-backed guarantee, multilateral and bilateral lenders can lend directly to state-owned companies in the energy sector without on-lending through the MOF, which aims to speed up financing for projects. PLN is working closely with ADB to implement a series of results-based lending programs to strengthen the electricity grid in various parts of the country. Given that sector policies underpin project outcomes and enable private sector investment, ADB's energy sector strategy, as elaborated in the country partnership strategy, aims to deploy policy-based lending, project financing, and results-based lending in a mutually reinforcing way. ADB's private sector operations will support de-risking geothermal exploration and development, as well as cutting-edge renewable energy technologies including gas-to-power, wind power, solar photovoltaic; and battery storage production.

[14] ADB. 2020. *Country Partnership Strategy: Indonesia, 2020–2024—Inclusive, Competitive, and Resilient.* Manila.
[15] ADB. 2018. *Sustainable Infrastructure Assistance Program - Indonesia Energy Sector Assessment and Priorities 2020–2024 (Subproject 14): Technical Assistance Subproject Report.* Manila.

Problem Tree for the Energy Sector