SUMMARY SECTOR ASSESSMENT: ENERGY[1]

A. Sector Performance, Problems, and Opportunities

1. Under a new administration, Indonesia has set an ambitious annual economic growth rate target of 8% by 2019. This growth, if achieved, has the potential to nearly triple Indonesia's demand for electricity from 2010 to 2030. At the same time, the country is transitioning from a significant energy exporter that subsidizes domestic energy prices, to one that imports a substantial amount of its energy needs at global market prices. It is also seeking to transition from a bulk commodity exporter to a more manufacturing and services-oriented industry. Recognizing that economic growth will depend on the acquisition of sufficient sustainable energy sources, the government recently launched a series of energy reforms that will be accelerated during 2015–2019.

2. **Primary energy.** Indonesia has an abundance of most forms of energy. Coal resources total around 120.5 billion tons, proven oil resources about 3.69 billion barrels, and proven natural gas reserves about 101.54 trillion cubic feet.[2] The country's renewable energy potential is also considerable, including geothermal energy at 28,000 megawatts (MW), hydropower at 75,000 MW, micro- and mini-hydropower at 1,013 MW, solar at 4.80 kilowatt-hours (kWh)/square meter/day, biomass at 32,654 MW, and wind at 3–6 meters/second (footnote 2).

3. Despite the high potential, nearly every energy subsector is facing constraints. Oil drove economic growth and revenue for many years, but slowing domestic production and rising demand recently made the country a net importer. Indonesia is still a net exporter of gas, but could become a net importer by 2022 due to a combination of high export obligations, low domestic prices, an uncertain regulatory framework that discourages the private sector, and the high infrastructure cost of connecting production to consumption centers. Indonesia's abundant coal resources drive a booming export industry and, according to the long-term plans of the State Electricity Corporation (PLN), will eventually underpin domestic power generation. This will also depend on timely investments in extraction and transportation infrastructure. Due in large part to increased coal and coal-based electricity generation, continued reliance on fossil fuels is expected to become a primary driver behind Indonesia's rising greenhouse gas emissions.

4. Efforts to scale up renewable energy use, particularly geothermal, have been constrained by inefficiencies caused by sector policies, implementation challenges, lack of capacity, environmental issues, permit delays, and a history of low energy pricing. Despite studies indicating a 10%–35% savings potential from energy efficiency across several economic subsectors, low energy pricing combined with a lack of enforced energy conservation guidelines have discouraged energy efficiency measures. This may soon change given extensive electricity and fuel pricing reforms during 2014–2015, which could make energy efficiency and conservation measures more viable. Meanwhile, more than 42 million people (about 16% of the nation's population) are not yet connected to the electricity grid.

5. **Sector structure.** The National Energy Council establishes 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 the sector. Additional government

[1] This summary is based on the energy sector assessment, strategy, and road map of the Asian Development Bank for Indonesia (final draft of November 2015).

[2] Government of Indonesia, Ministry of Energy and Mineral Resources. 2014. *Handbook of Energy and Economic Statistics of Indonesia*. Jakarta.

agencies that could become involved in a given energy project include the Ministry of Finance, the National Development Planning Agency (BAPPENAS), the Ministry of State-Owned Enterprises, the Ministry of Forestry, and the Ministry of Environment. Local government plays a large role in project implementation, mostly through permit and land acquisition process requirements, which often lead to unpredictable project delays. Various state-owned enterprises are charged with achieving state-mandated energy goals, thus beholding them to multiple government ministries such as the Ministry of Finance 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, including for power generation, transmission, distribution, and the retail sale of electricity. Other key energy sector state-owned enterprises include Geo Dipa Energi, Pertamina,, Pertamina Geothermal Energy, and , Perusahaan Gas Negara.

6. **Power generation**. As of 2013, Indonesia's total power generating capacity (including captive and off-grid generation) was approximately 44,000 MW, of which PLN owned 36,897 MW and procured the remainder from contracted independent power producers.[3] Most electricity is from coal (44%), followed by fuel oil (23%), gas power plants (21%), hydropower (7%), and geothermal power (5%).[4] Java, Madura, and Bali (JAMALI) islands account for 32 gigawatts (GW) of power, or approximately 80% of Indonesia's total installed capacity; they service the needs of 60% of the total population. Sumatra and Kalimantan islands have the next largest systems. The rest of PLN's generating capacity is spread across 600 isolated systems in areas where electricity demand tends to be low but rising. Facing potential electricity shortages, the government introduced a series of accelerated generation programs in 2015, known as fast-track programs, to bring 42.9 GW of generation online by 2019 through PLN and the private sector.[5] Coal-fired power dominates these plans, but geothermal and hydropower are also included.

7. **Transmission and distribution.** PLN owns and operates 39,900 circuit-kilometers of transmission lines and 108,789 megavolt-amperes of transformer capacity, which are spread across eight interconnected networks and 600 isolated grids. Plans to extend Indonesia's transmission network to 50,000 circuit-kilometers by 2020 will depend on the ability to identify financing and obtain time-consuming approvals for right-of-way and substations. PLN also holds a virtual monopoly over Indonesia's distribution systems and is thus essentially responsible for its expansion. The network has begun to deteriorate and several high-density areas (e.g., Bandung, Jakarta, Medan, and Surabaya) face regular overloading and unreliable supply. The capital expenditure needs for maintaining and expanding the transmission and distribution systems are estimated at $7.4 billion for Sumatra (2015–2019), $10.5 billion for Java–Bali (2016–2020), and $3.9 billion for Eastern Indonesia (2017–2021).

8. **Pricing and subsidies.** The government provides a subsidy to PLN to compensate for the company's inability to recover its costs through tariffs. Subsidy payments are calculated to bring the total of the tariff and subsidy to equal PLN's costs plus a margin of 7%. The government may soon revise the subsidy arrangements to performance-based regulation, which would relate allowed revenues to key expenditure items. Costs controllable by PLN would be benchmarked to regional peers, and costs not controllable by PLN would pass through into allowed revenue. This may provide an incentive for more efficient operations.

9. Until recently, all tariff classes received some subsidy. In 2014–2015, the new

[3] In addition, captive power generation capacity in the country is about 5,400 MW (PLN Statistics, 2014).
[4] Government of Indonesia, State Electricity Corporation (PLN). 2015. *Electricity Power Supply Business Plan (RUPTL), 2015–2024*. Jakarta.
[5] This amount represents the target generation additions of three successive fast-track programs, the most recent and most ambitious of which aims to add 42 GW of power by 2019.

administration embarked on reform by removing subsidies on gasoline and raising the price of diesel by nearly 30%, while also removing power tariff subsidies and putting in place automatic price adjustment for all but a few categories of consumers. In accordance with overall subsidy reform, the electricity subsidy is now being gradually phased out according to consumer class, until all but the poorest households receive electricity at the market price by 2018. As of June 2015, the tariff for the highest residential category was Rp1,524.24/kWh ($0.12/kWh), with tariffs for industrial and commercial consumers at that rate or above.

10. **PLN's financial capacity.** As a state-owned enterprise and vertically integrated monopoly, PLN is closely involved with government in budgeting, capital expenditure planning, and coordinating fuel supply for power generation. The government supports PLN's capital investments through guarantees, converting debt to equity, and debt restructuring. However, these current arrangements are unlikely to meet the energy sector's financial demands over the medium term. Under the accelerated generation programs, PLN estimates that $40.1 billion will be needed during 2015–2019 to deliver its generation, transmission, and distribution expansion plans (in addition to an estimated need for $43.4 billion from independent power producer investment). This far exceeds PLN's actual capital expenditure over recent years. PLN has secured some external funding from the national budget and committed loans, but still estimates that its funding gap during 2015–2019 could reach Rp392 trillion ($30.2 billion).

B. Sector Strategy

11. Indonesia's broad development goals are outlined in its National Long-Term Development Plan, 2005–2025(RPJPN). The national plan is divided into four 5-year phases, each governed by a national medium-term development plan (RPJMN). Longer-term goals for the energy sector are outlined in Presidential Decree No. 5/2006 (revised in 2014), the National Energy Policy, which emphasizes resource diversification, environmental sustainability, and maximizing the use of domestic resources. The policy's target energy mix by 2025 is oil (25%), gas (22%), coal (30%), and new and renewable energy (23%) In June 2015, the Ministry of Energy and Mineral Resources announced plans to reach 19% renewable energy by 2019. Long-term goals for electricity are also contained in the government's National Electricity Development Plan, 2012–2031, which roughly reflects the specific investment plans outlined in PLN's annual Electricity Power Supply Business Plan, 2015–2024.

12. The government is in the process of undertaking policy reform to resolve sector constraints. The RPJMN, 2015–2019 aims to increase (i) the installed capacity for electricity generation in the country to 86 GW, (ii) the annual per capita electricity consumption to 1,200 kWh, and (iii) the national electrification ratio to 96.6%. Targeted reforms initiated during 2013–2014 aim to expand energy production through greater private sector investment and more effective public sector investment; increase the country's reliance on domestic gas, and expand renewable energy generation and energy efficiency investments; and expand access to modern energy for all Indonesians. Sustained and comprehensive efforts are now needed to translate these goals into tangible outcomes in the medium term.

C. ADB Sector Experience and Assistance

13. Since 1967, the Asian Development Bank (ADB) has financed 21 loan projects totaling $2.81 billion to the energy sector. With few exceptions, the loan projects have succeeded in achieving their expected outputs and immediate objectives. ADB's investment since 2000 includes six loans totaling $1.04 billion: Power Sector Restructuring Program ($380 million), Renewable Energy Development Sector Program ($161 million), Power Transmission

Improvement Sector Project ($140 million), Java–Bali Electricity Distribution Performance Improvement Project ($50 million), West Kalimantan Power Grid Strengthening Project ($49.5 million), and Java–Bali 500 kV Crossing Project ($224 million).

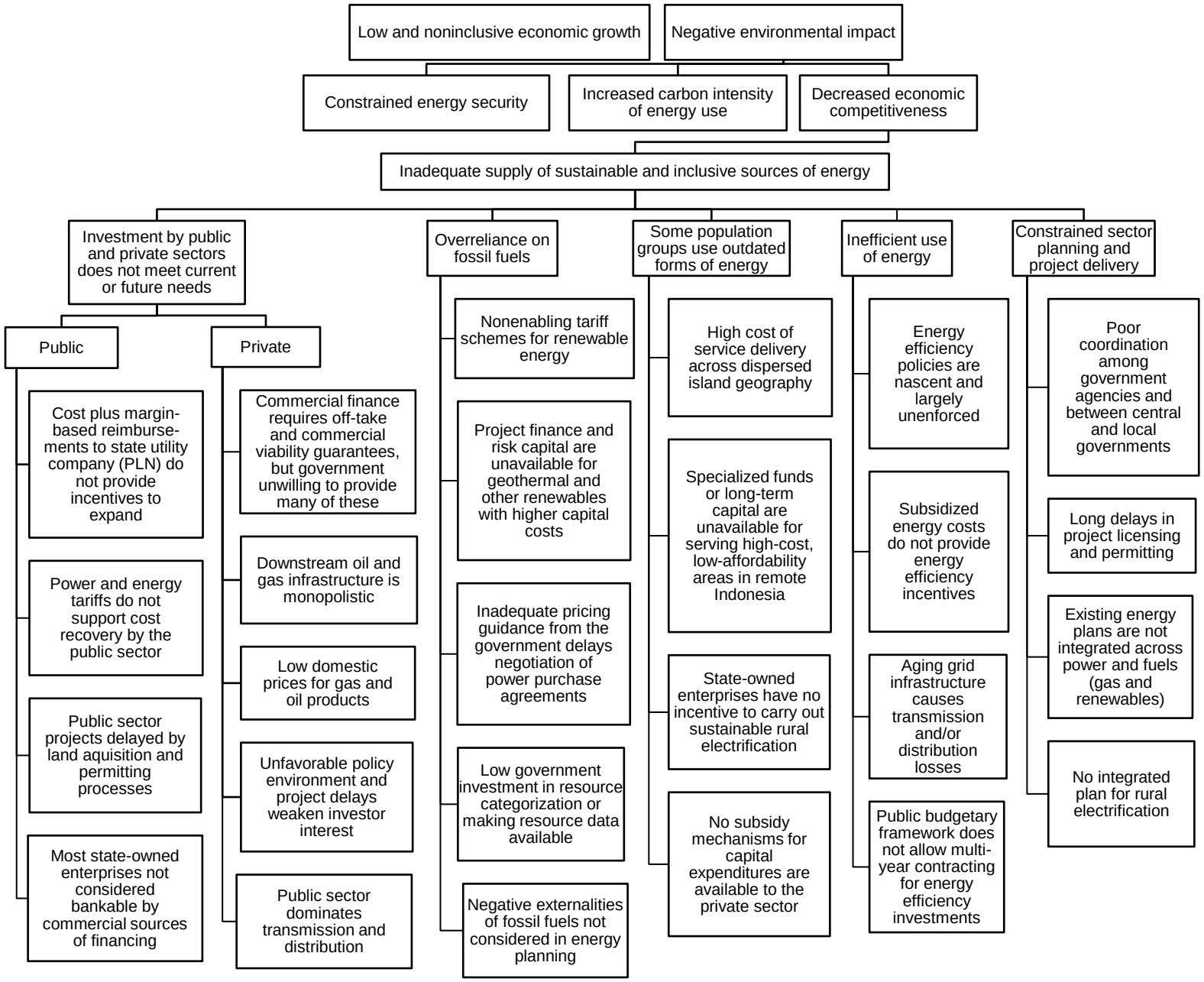
14. During 2013–2015, ADB also provided wide-ranging and significant technical assistance, which supported the initiation of the government's reform agenda, including (i) supporting policy dialogue on reduction of subsidies and cost-recovery tariffs for fuels and electricity, (ii) revising the geothermal law and improving the tariff scheme, (iii) developing proposals for a tariff scheme for wind energy and solar photovoltaic rooftop plants, (iv) establishing opportunities for regional power trade and interconnections within the Association of Southeast Asian Nations, (v) putting in place the building blocks for an energy efficiency market place, and (vi) evaluating the prospects for carbon capture and storage.

15. The government has indicated that during 2015–2019 it will work to accelerate financing for energy infrastructure development. It is seeking to do this by establishing direct lending using a sovereign-backed guarantee modality wherein multilateral and bilateral lenders can lend directly to energy sector state-owned companies without going through the Ministry of Finance. This regulation, expected during 2015, should speed up project financing. The government is working closely with ADB to pilot a results-based lending approach for PLN's electricity grid-strengthening programs. The modality would use country systems and base loan disbursement on achievement of results. Meanwhile, the more traditional policy-based lending to the government, and ADB's private sector department lending to the private sector and state-owned companies for financing of projects through the nonsovereign modality would continue.[6]

16. Going forward, ADB's engagement in the sector will continue to be centered on three areas: (i) knowledge and awareness, (ii) policy and mainstreaming of best practices, and (iii) the financing of energy infrastructure. In alignment with the government's RPJMN, 2015–2019 and overall plans for sector reform, the promotion of energy security will be one of three strategic pillars proposed in the ADB country partnership strategy, 2015–2019. ADB will help the government with its reform program, with specific efforts to (i) undertake sector policy reform for sustainable and inclusive energy access; (ii) strengthen the reach, reliability, and efficiency of the nation's electricity grid through results-based lending; and (iii) enable greater use of clean sources of primary energy through project financing. ADB will also provide technical assistance to expand energy efficiency, carbon capture and storage, and electricity access. These priorities align with ADB's Midterm Review of Strategy 2020, which emphasizes inclusive economic growth, infrastructure development, and policy-based engagements in middle-income countries.[7]

[6] The private sector will undertake most of the capacity additions.
[7] ADB. 2014. *Midterm Review of Strategy 2020: Meeting the Challenges of a Transforming Asia and Pacific*. Manila.

PROBLEM TREE FOR ENERGY



Sector Results Framework (Energy 2015–2019)

Country Sector Outcome		Country Sector Outputs		ADB Sector Operations	
Outcomes with ADB Contributions	**Indicators with Targets and Baselines**	**Outputs with ADB Contributions**	**Indicators with Incremental Targets**	**Planned and Ongoing ADB Interventions**	**Main Outputs Expected from ADB Contributions**
Sustainable energy access achieved for all Indonesians: (i) availability of primary energy increased (ii) energy infrastructure for providing electricity and gas constructed, upgraded, and expanded; and (iii) electricity generated from new and renewable sources increased.	Percentage of households with an electricity connection increased to RPJMN target of 96.6% by 2019 (2014 baseline: 84.0%) Proportion of gas used for domestic consumption increased to 64% in 2019 (2014 baseline: 53%) Primary energy intensity decreased to 463.2 BOE/billion rupiah of GDP by 2019 (2014 baseline: 487.0 BOE/billion rupiah of GDP Power generation capacity increased to 86.6 GW by 2019 (2014 baseline: 50.7 GW) Share of new and renewable energy increased to 10% of the energy mix by 2019 (2014 baseline: 6%)	Sector policy reforms conducted for sustainable and inclusive energy access The reach, reliability, and efficiency of the nation's electricity grid strengthened Capacity from clean sources of energy increased	Percentage of private sector participation in installed electricity generation capacity, increased to 30% by 2019 (2014 baseline: 17%) Private sector participation in the gas subsector increased to $20 billion/year by 2019 (2014 baseline: $15 billion) Number of PLN customers increased by 3% per year (2014 baseline: 57,493,234) PLN energy sales increased by 3% per year (2014 baseline: 198,601.78 GWh) Generation capacity from renewable energy sources increased by an additional 430 MW by 2019 (2014 baseline: 1,600 MW)	**Planned key activity areas** Policy and regulatory reforms Power generation Electricity transmission and distribution Efficiency improvement Renewable energy **Pipeline projects with estimated amounts** Sustainable and Inclusive Energy Program ($900 million) Electricity Grid Strengthening Program ($2,350 million) Clean Energy Generation Projects ($1,100 million) **Ongoing projects with approved amounts** Java–Bali Distribution Performance Improvement Project ($50 million) West Kalimantan Power Grid Strengthening Project ($49.5 million) Java–Bali 500 kV Transmission Line Crossing ($224 million) Sarulla Geothermal Power Development Project ($250 million) Rantau Dedap Geothermal Power Development Project ($50 million)	**Planned key activity areas** Market-based pricing of fuels and power Streamlined project licensing and permitting for energy projects Access to clean energy increased 3.0 million new customers connected to the electricity grid by 2019 SAIDI reduced by 15% from 2014 baseline in project areas **Pipeline projects** Improved sector governance Existing transmission and distribution systems strengthened and expanded Generation capacity added from clean energy sources: geothermal 330 MW and gas 100 MW **Ongoing projects** Distribution losses in selected areas of the Java–Bali grid reduced Sarawak–West Kalimantan interconnection network constructed New distribution network in West Kalimantan constructed 8,000 new connections to households in West Kalimantan by 2016 500 kV transmission networks between Java and Bali developed Geothermal power generation in North Sumatra expanded

ADB = Asian Development Bank, BOE = barrels of oil equivalent, GDP = gross domestic product, GW = gigawatt, GWh = gigawatt-hour, kV = kilovolt, MW = megawatt, PLN = Perusahaan Listrik Negara (State Electricity Corporation), RPJMN = National Medium-Term Development Plan, SAIDI = system average interruption duration index.

Sources: Government of Indonesia. 2015. *National Medium-Term Development Plan (RPJMN), 2015–2019.* Jakarta; Government of Indonesia, State Electricity Corporation (PLN). 2015. *Electricity Power Supply Business Plan (RUPTL), 2015–2024*. Jakarta; and Asian Development Bank.