SECTOR ASSESSMENT (SUMMARY): ENERGY[1]

A. Sector Road Map

1. Sector Performance, Problems, and Opportunities

1. Indonesia has set an ambitious target to raise its annual economic growth rate to 8% by 2019. Achieving this could nearly triple Indonesia's demand for electricity during 2010–2030. At the same time, Indonesia is transitioning from a significant energy exporter that subsidized domestic energy prices to a country that must import much of its energy needs at global market prices. It is also seeking to replace its prime exports from bulk commodity exports to manufacturing products and services. Recognizing that its economic growth goals will depend on the country's ability to harness sufficient sustainable energy sources, the government launched a series of energy reforms during 2013–2014. They are expected to accelerate during 2015–2019.

2. **Primary energy.** Indonesia enjoys an abundance of nearly every form of energy. Estimates put its coal resources at 120.5 billion tons, proven oil resources at 3.7 billion barrels, and proven natural gas reserves at 101.5 trillion cubic feet.[2] Indonesia's renewable energy potential includes the world's largest potential geothermal energy resources, at 28,000 megawatts (MW); hydropower potential of 75,000 MW; micro and mini hydropower potential of 1,013 MW; solar potential of 4.8 kilowatt-hours per square meter per day, biomass potential of 32,654 MW; and wind potential of 3–6 meters per second (footnote 2). Nearly every energy subsector is facing constraint. Oil drove economic growth for many years, but slowing domestic production and rising demand made the country a net importer in 2004. Indonesia is still a net exporter of gas but could become a net importer by 2022. This is due to high export obligations, a history of subsidizing fossil fuels, an uncertain regulatory framework that discourages private sector investment, and the high cost of infrastructure for connecting production to consumption centers. Indonesia's coal resources drive a booming export industry. According to the plans of the State Electricity Corporation (Perusahaan Listrik Negara, PLN), coal will eventually underpin domestic power generation rather than oil, although this will require investments in extraction and transport infrastructure. Greenhouse gas emissions will rise sharply given the country's plans to increase coal and coal-based fuel use for electricity during 2015–2025.

3. Efforts to scale–up renewable energy use, particularly geothermal power, have been constrained by inefficient sector policies, implementation challenges, lack of capacity, environmental issues, permitting delays, and a history of low energy pricing. Despite studies indicating a potential for achieving energy savings of 10%–35% by improving energy efficiency in several economic subsectors, energy efficiency measures are rarely adopted by consumers due to low energy pricing, and insufficient and poorly enforced energy conservation guidelines from the government. This may change due to extensive electricity and fuel pricing reforms introduced by the government in 2014–2015 that could make energy efficiency and conservation measures more viable. Meanwhile, more than 35 million people, or about 16% of the nation's population, continue to lack access to electricity.

4. **Sector structure.** Overarching goals and policies for the energy sector are set by the government's national energy council, the Dewan Energi Nasional. The Ministry of Energy and

[1] This summary is based on a draft of the Asian Development Bank's energy sector assessment, strategy, and road map, which is expected to be finalized in November 2015.

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

Mineral Resources is the primary government body responsible for regulating and governing Indonesia's energy sector. Among the additional government agencies that could become involved in a given energy project are the Ministry of Finance (MOF); BAPPENAS, which is the national 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 permitting and land acquisition process requirements 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 the 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 infrastructures in the country and is responsible for the generation, transmission, distribution, and the retail sale of electricity. Other key energy sectors state-owned enterprises include Pertamina, Perusahaan Gas Negara, Geo Dipa Energi, and Pertamina Geothermal Energy.

5. **Power generation**. As of 2013, Indonesia's total power generating capacity, including captive and off–grid generation, was approximately 44,000 MW, of which 36,897 MW was owned by PLN and the rest procured by PLN from contracted independent power producers.[3] Most of Indonesia's electricity is from coal (44%). This is followed by fuel oil (23%), gas power plants (21%), hydropower (7%), and geothermal power (5%).[4] The islands of Java, Madura, and Bali account for 32 gigawatts (GW) of power. The next largest systems are on the islands of Sumatra and Kalimantan. The rest of PLN's generating capacity is spread across 600 isolated systems in areas where electricity demand tends to be low but rising. The government introduced a series of fast-track generation programs in 2015 aimed at having PLN and private sector participants bring 42.9 GW of generation on line by 2019.[5] Coal–fired power dominates these plans, but geothermal and hydropower are also included.

6. **Transmission and distribution.** PLN owns and operates 46,597 circuit kilometers of transmission lines and 108,789 mega-volt ampere of transformer capacity, spread across eight networks and 600 isolated grids. Plans to extend Indonesia's transmission network by 2020 will depend on reducing bottlenecks, identifying financing, and obtaining the approvals for right of way and substations. The distribution network has begun to deteriorate, and regular overloading and unreliable supply now affect several high–density areas. Financing needs for the country's 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).

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. Subsidy payments are calculated to make the total of the tariff and subsidy revenue equal to PLN's costs plus a margin of 7%. The government may revise the subsidy to an economic regulation that 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.

8. During 2014–2015, the new administration embarked on reform 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. It is now gradually

[3] In addition, captive power generation capacity in the country is about 5,400 MW (PLN Statistics Report, 2014).
[4] Government of Indonesia, PLN. 2014. *Electricity Power Supply Business Plan (RUPTL 2015–2024)*. Jakarta.
[5] This amount represents the additional generation targeted by three successive fast-track programs. The most ambitious of these, launched in 2015, aims to add 35 GW of power by 2019.

phasing out the electricity subsidy according to consumer class. It plans to continue this process until all but the poorest households receive electricity at the market price by 2018. By June 2015, the highest tariff for the residential category was Rp1,524.24 ($0.12) per kilowatt-hour. Tariffs for industrial and commercial consumers were at that level or higher.

9. **State Electricity Corporation's financial capacity.** Because PLN is state-owned and a 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. PLN estimates that it will need $40.1 billion during 2015–2019 to deliver its planned expansion of generation, transmission, substations, and distribution. This is in addition to an estimated need for $43.4 billion in investment under the programs by the private sector, and far exceeds PLN's capital expenditures up to now. PLN has secured some external funding from the national budget and committed loans but estimates that its funding gap during 2015–2019 could reach Rp392 trillion ($30.2 billion).

2. Government's Sector Strategy

10. Indonesia's broad development goals are outlined in its long-term national development plan for 2005–2025.[6] This plan is divided into four 5-year phases, each with a medium-term national development plan. Long–term goals for energy specifically are outlined the 2014 national energy policy which emphasizes resource diversification, environmental sustainability, and maximized use of domestic resources.[7] The national energy policy targets an energy mix by 2025 of 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 make renewable energy 19% of this mix by 2019. The long–term goals in the electricity sector are set in the government's national electricity development plan for 2012–2031.[8] It roughly mirrors the specific investment plans outlined in PLN's annual long–term electricity development plan for 2015–2024.[9]

11. The government is seeking to resolve sector constraints. The medium-term national development plan for 2015–2019 aims to increase the installed capacity for electricity generation in the country to 86 GW, increase annual per capita electricity consumption to 1,200 kilowatt–hours, and raise the national electrification ratio to 96.6%.[10] Reforms initiated during 2013–2014 aimed to (i) expand energy production through greater private sector investment and more effective public sector investment, (ii) increase the country's reliance on domestic gas, (iii) expand renewable energy generation and energy efficiency investments, and (iv) expand access to modern energy for all Indonesians. Sustained, comprehensive efforts are now needed to translate these goals into tangible outcomes in the medium term.

3. ADB Sector Experience and Assistance Program

12. Over the past 47 years, the Asian Development Bank (ADB) has financed 21 projects with total lending of $2.81 billion in Indonesia's energy sector. With few exceptions, completed loan projects have delivered their expected outputs and achieved their immediate objectives.

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[6] Government of Indonesia. 2005. *National Long- Term Development Plan (RPJPN 2005–2025)*. Jakarta.
[7] Government of Indonesia. 2014. *National Energy Policy (KEN 2014–2050)*. Jakarta.
[8] Government of Indonesia. 2008. *National Government Electricity Plan (RUKN 2008-2027)*. Jakarta; Government of Indonesia. 2015 (Draft). *National Government Electricity Plan (RUKN 2015-2034)*. Jakarta.
[9] Government of Indonesia, PLN. 2014. *Electricity Power Supply Business Plan (RUPTL 2015–2024)*. Jakarta.
[10] Government of Indonesia. 2015. *Medium Term Development Plan (RPJMN 2015–2019)*. Jakarta.

ADB investments during 1999–2015 include six approved loans totaling $1.04 billion for (i) the Power Sector Restructuring Program ($380 million), (ii) the Renewable Energy Development Sector Program ($161 million), (iii) the Power Transmission Improvement Sector Project ($140 million), (iv) the Java-Bali Electricity Distribution Performance Improvement Project ($50 million), (v) the West Kalimantan Power Grid Strengthening Project ($49.5 million), and (vi) the Java-Bali 500-Kilovolt Power Transmission Crossing ($224 million).[11]

13. During 2013–2015, ADB also provided technical assistance to Indonesia's energy sector that helped the government get its reform agenda under way. Support included (i) policy dialogue on reducing subsidies and cost-recovery tariffs for fuels and electricity, (ii) the revision of the geothermal law and an improved tariff scheme, (iii) developing proposals for a tariff scheme for wind energy and solar photovoltaic rooftop plants, (iv) exploring opportunities for regional power trade and interconnections within the Association of Southeast Asian Nations, (v) establishing an energy efficiency market, and (vi) evaluating prospects for carbon capture and storage.

14. The government is seeking greater financing for energy infrastructure development during 2015–2019. It is establishing a sovereign-backed guarantee direct lending modality under which multilateral and bilateral lenders can lend directly to state-owned companies in the energy sector without going through the MOF. An enabling regulation is expected by the end of 2015. This aims to speed up financing for projects under the government's fast-track programs. The government is also working closely with ADB to pilot a results-based lending approach for PLN's programs to strengthen the electricity grid. This lending would use country systems, and loan disbursements would be based on the achievement of results. Meanwhile, ADB's more traditional policy-based lending to the government and ADB's nonsovereign lending to the private sector and state-owned companies to finance projects would also continue.[12]

15. 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 line with the government's medium-term plan for 2015–2019 and overall plans for sector reform, promoting energy security will be one of three strategic pillars in ADB's country partnership strategy for Indonesia for 2015–2019.[13] ADB will support the government's reform program by (i) undertaking sector policy reform for sustainable and inclusive energy access; (ii) strengthening the reach, reliability, and efficiency of the nation's electricity grid through results-based lending; and (iii) enabling greater use of clean sources of primary energy by financing projects. ADB will also provide technical assistance to expand energy efficiency, carbon capture and storage, and access to electricity. These priorities also align with ADB's midterm review of Strategy 2020, which emphasizes inclusive economic growth, infrastructure development, and policy-based engagements in middle-income countries.[14]

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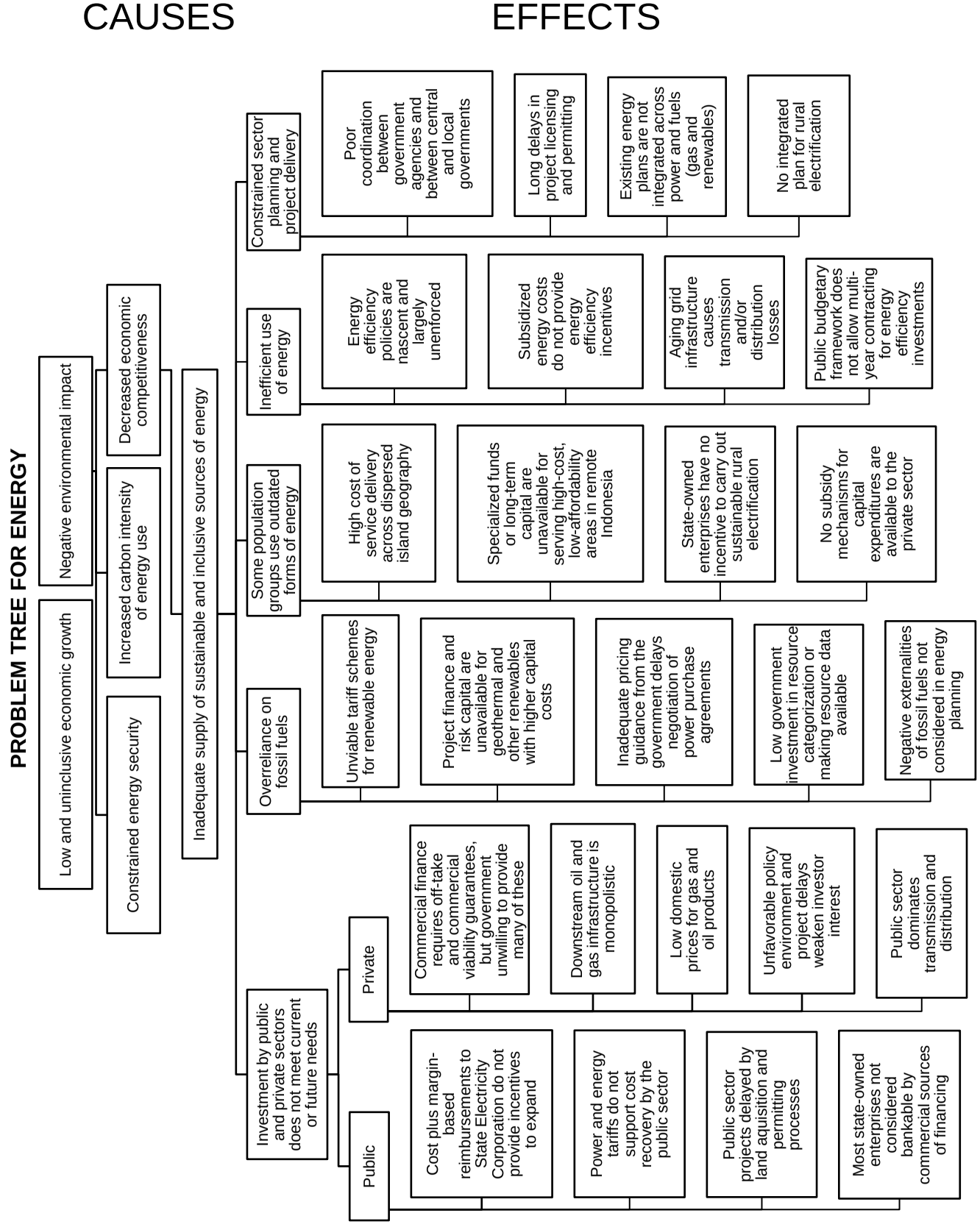
[11] ADB. 1999. *Report and Recommendation of the President to the Board of Directors: Proposed Loans to the Republic of Indonesia for the Power Sector Restructuring Program.* Manila; ADB. 2002. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Republic of Indonesia for the Renewable Energy Development Sector Project.* Manila; ADB. 2002. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Republic of Indonesia for the Power Transmission Improvement Sector Project.* Manila; ADB. 2010. *Report and Recommendation of the President to the Board: Proposed Loan and Administration of Loan and Grant to the Republic of Indonesia for the Java-Bali Electricity Distribution Performance Improvement Project.* Manila; ADB. 2013. *Report and Recommendation of the President to the Board of Directors: Proposed Loan and Administration of Loan and Grant to the Republic of Indonesia for the West Kalimantan Power Grid Strengthening Project.* Manila; ADB. 2013. *Report and Recommendation of the President to the Board of Directors: Proposed Loans to the Republic of Indonesia for the Java-Bali 500-Kilovolt Power Transmission Crossing.* Manila.

[12] The bulk of the capacity expansion is to be undertaken by the private sector.

[13] ADB's country partnership strategy for Indonesia for 2015–2019 is being prepared and will be finalized in 2016.

[14] ADB. 2014. *Midterm Review of Strategy 2020: Meeting the Challenges of a Transforming Asia and Pacific*. Manila.


CAUSES
EFFECTS
PROBLEM TREE FOR ENERGY
Low and uninclusive economic growth
Negative environmental impact
Constrained energy security
Increased carbon intensity of energy use
Decreased economic competitiveness
Inadequate supply of sustainable and inclusive sources of energy
Investment by public and private sectors does not meet current or future needs
Public
Private
Overreliance on fossil fuels
Some population groups use outdated forms of energy
Inefficient use of energy
Constrained sector planning and project delivery
Cost plus margin-based reimbursements to State Electricity Corporation do not provide incentives to expand
Power and energy tariffs do not support cost recovery by the public sector
Public sector projects delayed by land aquisition and permitting processes
Most state-owned enterprises not considered bankable by commercial sources of financing
Commercial finance requires off-take and commercial viability guarantees, but government unwilling to provide many of these
Downstream oil and gas infrastructure is monopolistic
Low domestic prices for gas and oil products
Unfavorable policy environment and project delays weaken investor interest
Public sector dominates transmission and distribution
Unviable tariff schemes for renewable energy
Project finance and risk capital are unavailable for geothermal and other renewables with higher capital costs
Inadequate pricing guidance from the government delays negotiation of power purchase agreements
Low government investment in resource categorization or making resource data available
Negative externalities of fossil fuels not considered in energy planning
High cost of service delivery across dispersed island geography
Specialized funds or long-term capital are unavailable for serving high-cost, low-affordability areas in remote Indonesia
State-owned enterprises have no incentive to carry out sustainable rural electrification
No subsidy mechanisms for capital expenditures are available to the private sector
Energy efficiency policies are nascent and largely unenforced
Subsidized energy costs do not provide energy efficiency incentives
Aging grid infrastructure causes transmission and/or distribution losses
Public budgetary framework does not allow multi-year contracting for energy efficiency investments
Poor coordination between government agencies and between central and local governments
Long delays in project licensing and permitting
Existing energy plans are not integrated across power and fuels (gas and renewables)
No integrated plan for rural electrification

Sector Results Framework (Energy, 2016–2019)

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 through: Increased availability of primary energy Construction, upgrading, and expansion of energy infrastructure for provision of electricity and gas Increased use of electricity generated from new and renewable sources	Percentage of households with an electricity connection increased from 84% in 2014 to 96.6% by 2019 Proportion of gas used for domestic consumption, increased from 53% in 2014 to 64% in 2019 Primary energy intensity decreased to 463.2 barrels of oil equivalent per Rp1 billion of GDP (2014 baseline: 487.0 barrels of oil equivalent per Rp1 billion) Power generation capacity, increased to 86.6 GW (2014 baseline: 50.7 GW) Share of new and renewable energy increased to 10% of the energy mix (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 oil and gas sector increased to $18 billion per year by 2019 (2014 baseline $14 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 clean energy sources increased by 430 MW by 2019	Planned key activity areas (i) Policy & regulatory reforms (ii) Power generation (iii) Electricity transmission & distribution (iv) Efficiency improvement (v) Renewable energy Pipeline projects with estimated amounts (i) Sustainable and Inclusive Energy Program ($900 million) (ii) Electricity Grid Strengthening Program ($2,350 million) (iii) Clean Energy Generation Projects ($1,100 million) Ongoing projects with approved amounts (i) Java-Bali Distribution Performance Improvement Project ($50 million) (ii) West Kalimantan Power Grid Strengthening Project ($49.5 million) (iii) Java-Bali 500-Kilovolt Power Transmission Crossing ($224 million) (iv) Sarulla Geothermal Power Development Project ($250 million) (v) Rantau Dedap Geothermal Power Project ($50 million)	Planned key activity areas (i) Market-based pricing of fuels and power, (ii) Streamlined project licensing and permitting for energy projects (iii) Access to clean energy increased (iv) 3.0 million new customers connected to the electricity grid by 2019 (v) SAIDI reduced by 15% from 2014 baseline in project areas Pipeline projects (i) Improved sector governance (ii) Existing transmission and distributions systems strengthened and expanded (iii) Generation capacity added from clean energy sources: geothermal (330 MW), and gas (100 MW) Ongoing projects: (i) Reduced distribution losses in selected areas of the Java–Bali grid (ii) Sarawak-West Kalimantan interconnection network constructed (iii) New distribution network in West Kalimantan constructed (iv) 8,000 new connections to households in West Kalimantan by 2016 (v) 500 kV transmission networks between Java and Bali developed (vi) Geothermal power generation in North Sumatra expanded

ADB = Asian Development Bank, GDP = gross domestic product, GW = gigawatt, GWh = gigawatt-hour, kV = kilovolt, MW = megawatt, PLN = State Electricity Corporation, SAIDI = system average interruption duration index.

Sources: Government of Indonesia. 2015. *National Medium-Term Development Plan (RPJMN 2015–2019)*. Jakarta; Government of Indonesia, PLN. 2014. *Electricity Power Supply Business Plan (RUPTL 2015–2024)*. Jakarta; Asian Development Bank.