

SECTOR ASSESSMENT (SUMMARY): ENERGY¹

1. Sector Performance, Problems, and Opportunities

1. **Energy sector performance.** The energy sector is a main source of Myanmar's national income and accounted for 55% of exports and 86% of foreign direct investment in 2013. Access to energy is also a basic human need and a requirement for socioeconomic development. Due to lack of domestic capacity and investments, however, the energy sector in Myanmar is underdeveloped.

2. **Energy consumption.** Energy consumption in the country increased by an average 2.3% during 2000–2012. Coal use grew by an annual average of 21.0%, followed by natural gas at almost 4.4%. The annual growth for biomass energy use was 1.9% in 2012. The residential sector accounted for 80.0% of the total consumption in 2012—mainly in the form of biomass (fuel wood and charcoal). The commercial sector showed the highest average annual consumption growth during 2000–2012, at 5.8%, followed by the residential (1.4%) and industrial (1.2%) sectors. Transport consumption declined by an annual average of 3.0% over the same period.

3. Myanmar has one of the lowest per capita electricity consumption rates in the world. It stood at 165 kilowatt-hour (kWh) per capita in 2013, (compared to the world's average of 3,000 kWh) and even lower than least developed country's average of 174 kWh per capita. Compared with the size of its population and economy, its consumption level of modern energy resources is very low. The low use and availability of and poor access to electric power is an obstacle to efforts to improve living standards and expand industrial activities.

4. **Primary energy supply.** The country's total primary energy supply was about 18 million tons of oil equivalent (MTOE) in 2012. Of this total, 54.0% or 9.7 MTOE supply was from biomass, followed by 16.6% (3 MTOE) from hydro, 15.3% (2.8 MTOE) from oil, 11.5% from gas, and 2.6% from coal. Hydro supply grew fastest during 2000–2013 (by an average 12.8% annually), and coal (25.0%) was second.

5. **Gas, oil, and coal resources.** Myanmar has proven gas reserves of 10 trillion cubic feet and proven oil reserves of 135 million barrels. Oil consumption exceeds oil production, refinery capacity is inadequate, and imports of petroleum products (particularly gasoline and diesel) have been on the rise. The country's 33 major identified coal deposits have estimated reserves of 489 million tons.

6. **Power subsector overview.** Total installed electricity generation capacity in 2014 was 4,366 megawatts (MW), including 3,005 MW from hydropower, followed by 1,236 MW from gas, 120 MW from coal, and 5 MW renewable energy sources. The low efficiency of the aging power system and the high reliance on hydropower has led to power shortages and frequent load shedding, particularly during the dry season. According to statistics of the Myanmar Electric Power Enterprise, in 2012, power supply reached its maximum of 1,800 MW in the rainy season but topped out at only 1,300 MW during the dry months, even though peak system demand was 1,790 MW. Total electricity consumption was 10,112 gigawatt-hours in 2013, of which the city of Yangon accounted for about half. Consumption grew at a compound annual rate of 9.8% during 2000–2012.

¹ This summary is based on the draft Myanmar Energy Sector Assessment, Strategy, and Road Map 2015 (available on request).

7. **Generation system.** To meet current and future demand, the government has an ambitious plan to build 12 new hydropower plants with a total capacity of 2,421 MW, 10 new coal power plants of 4,775 MW in total capacity, and 11 gas power plants that will generate 3,187 MW of electricity. This plan faces obstacles, including the environmental impact and large up-front cost of large hydropower developments and the limited domestic availability of natural gas and the proper quality of coal.

8. **Transmission system.** Currently, the country's electric power transmission system comprises a network of 66 kilovolt (kV), 132 kV, and 230 kV transmission lines with a total length of 10,058 kilometers (km). It includes (i) 44 230 kV lines with a total length of 3,979 km; (ii) 41 132 kV lines covering 2,334 km; (iii) 100 66 kV lines totaling 3,729 km in length; and (iv) 69 substations. Most of these lines run between the North, where most of the country's hydropower plants are located, and the Yangon area. In addition, new 500 kV transmission lines are being developed in order to create a transmission backbone connecting the North generation centers to the major load centers in the South.

9. **Distribution system.** The electricity distribution system comprises a network of 33 kV, 11 kV, and 6.6 kV lines and substations. Most of distribution facilities are outdated and inadequate for current loads. Many conductors are not insulated and vulnerable to external accidents that can easily cause power outages that last from a few minutes to a few hours. The system lacks an automation and communications equipment, and most are operated manually. To improve efficiency and reduce losses, the government plans to phase out 6.6 kV networks, upgrade them to 11 kV networks, and expand the 33 kV networks.

10. **Electricity tariff.** Myanmar's electricity tariff is below the actual cost of supply, even though the government has implemented tariff increases, including one in April 2014. Current rates are MK35–MK50 for residential consumers and MK100–MK150 for industrial and business consumers, depending on consumption.

11. **National electrification.** Only 31% of Myanmar's people had access to electricity in 2013. The regions and states with highest electrification rates were Yangon (78%), followed by Nay Pyi Taw (65%), Kayah (46%), and Mandalay (40%). The lowest rates were in Kayin (6%), Taninthary (9%), and Ayeyarwaddy (11%). The government considers the low electrification rate in rural areas to be a priority concern, and it aims to electrify the country entirely by 2030.

2. Government's Sector Strategy

12. **Energy sector policy framework.** ADB and other development partners have been helping the government update the energy policy framework since 2012. The efforts have focused particularly on formulating an (i) energy sector policy, (ii) an energy sector master plan, (iii) an electricity law, (iv) a national electrification plan, and (v) a national electricity master plan. The energy sector policy was approved by the country's President in March 2014, and the new electricity law was promulgated in 2014. The law envisages the establishment of an electricity regulatory commission to prepare rules and regulations for the power subsector.

13. **Sector problems and challenges.** Among the energy challenges Myanmar faces is the need to reform the governance structure and institutional arrangements in the sector to improve business performance. Various energy enterprises responsible for business operations remain as operational departments under the ministries. These enterprises are not financially autonomous. For example, the Myanmar Electric Power Enterprise, in charge of power transmission is a department under the Ministry of Electric Power (MOEP). It receives government budget for its

investment and operations and turn over its income and revenues to the MOEP. In addition, the sector is not able to mobilize the capital required for the investments prescribed by the government's ambitious energy plan. The energy enterprises cannot access commercial financing resources because they are not financially autonomous. Finally, the sector lacks human resources and technical capacity. Technical training and education in the electrical and resource engineering fields are in short supply in Myanmar, and the research and statistical capacity needed to plan and implement investments are generally weak.

3. ADB Sector Experience and Assistance Program

14. **ADB's sector experiences.** ADB has been a lead development partner in Myanmar's energy sector since it reengaged with the country in early 2012, particularly in helping to strengthen government capacity and improve sector policies, strategies, plans, and laws through technical assistance (TA) and policy dialogue. ADB has provided TA and grants in such areas as (i) developing capacity and institutions; (ii) developing policies, strategies, master plans, and legal and regulatory frameworks; (iii) the demonstration of off-grid renewable energy use in Chin, Kayah, and Rakhine states; (iv) assessing financial management in the energy sector; (v) strengthening the country's safeguard system; and (vi) developing a public-private partnership framework.² In 2013, ADB approved a loan of \$60 million to help the government rehabilitate the distribution network in five townships in Yangon region, four districts in Mandalay region, five districts in Sagaing region, and two townships in Magway region.³ An \$80 million loan and project proposed for approval in 2015 will continue this effort and focus on building or upgrading 230 kV transmission lines and substations in Yangon.

15. **ADB's sector assistance strategy.** The government energy sector master plan, was completed in 2015 with ADB support. Along with the national electricity master plan (completed with support by Japan International Cooperation Agency) and the national electrification plan (supported by the World Bank), it sets clear directions and strategies to develop energy resources sustainably, expand energy infrastructure economically, and provide reliable services to meet domestic demand and for export. ADB is playing a key role in helping the government to fully engage and be consulted in the process and to coordinate the work of the country's development partners. ADB foresees a need for greatly increasing assistance for power subsector development (paras. 16–21).

16. **Energy infrastructure rehabilitation and expansion.** The sector needs to accelerate the rehabilitation and expansion of all generation, transmission, and distribution facilities if the government's 2030 100% electrification target is to be met. ADB will mobilize financial resources for investment projects identified in the master plans that involve (i) transmission and distribution rehabilitation and expansion and (ii) electrification in poor rural areas. ADB will provide investment and TA from its sovereign lending resources to Ministry of Electric Power and assistance from its nonsovereign resources to support private sector investments.

² ADB. 2013. *Technical Assistance to the Republic of the Union of Myanmar for Enhancing the Power Sector's Legal and Regulatory Framework*. Manila (TA 8469-MYA); ADB. 2014. *Technical Assistance to the Republic of the Union of Myanmar for Support for Public-Private Partnership Framework Development*. Manila (TA 8624-MYA); ADB. 2012. *Technical Assistance to the Republic of the Union of Myanmar for Capacity Development and Institutional Support*. Manila (TA 8244-MYA); ADB. 2013. *Technical Assistance to the Republic of the Union of Myanmar for Financial Management Assessment of Energy Sector*. Manila (TA 8216-MYA); and ADB. 2014. *Technical Assistance for Off-Grid Renewable Energy Demonstration Project*. Manila (TA 8657-MYA).

³ ADB. 2013. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Republic of the Union of Myanmar for the Power Distribution Improvement Project*. Manila (Loan 3084-MYA [SF]).

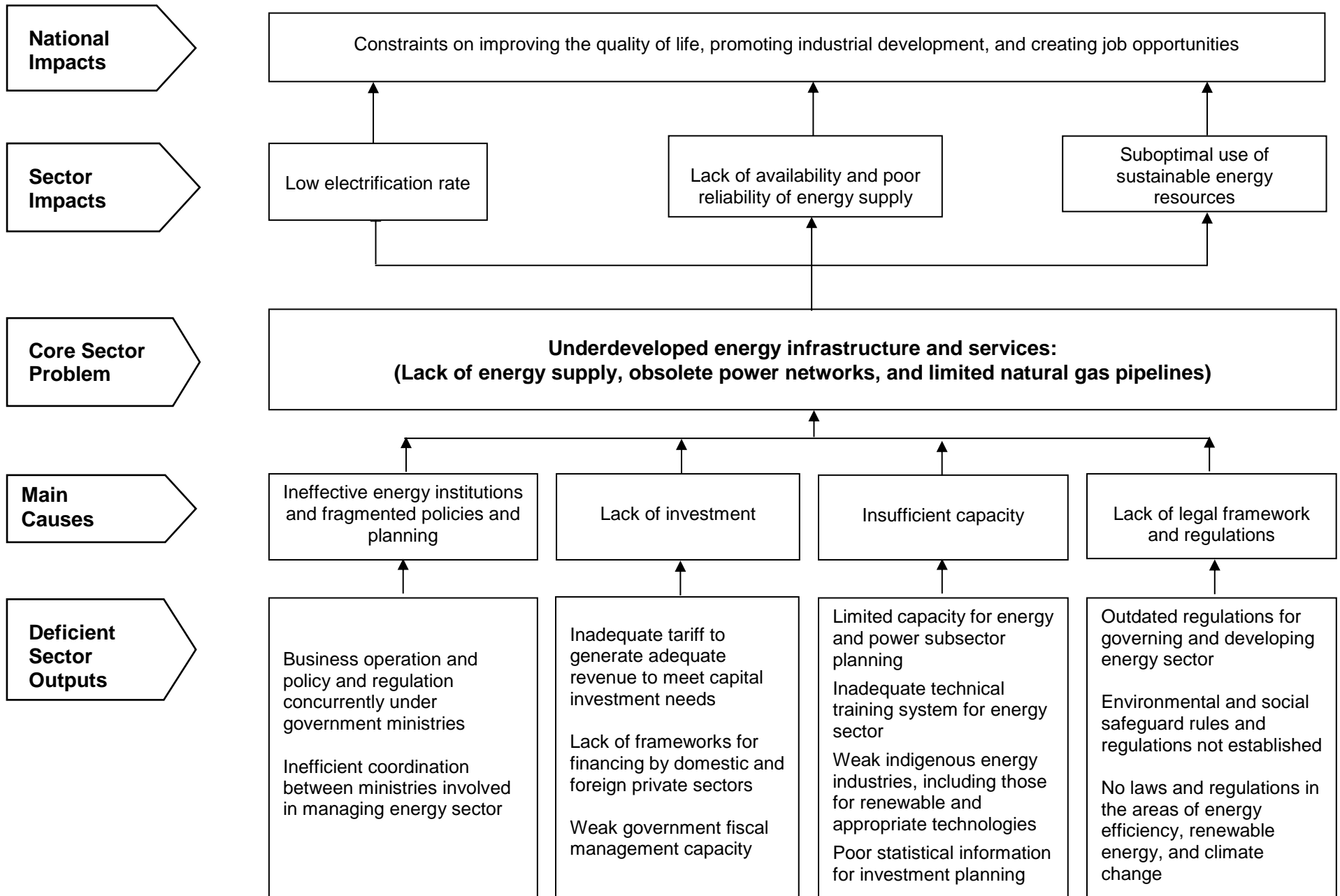
17. **Sector governance and management improvement.** The current governance and management structure of the energy sector involving Ministry of Energy, Ministry of Electric Power, and Ministry of Livestock, Fisheries and Rural Development, needs reform to clearly separate the mandates of policy development, rule-making and enforcement, and business operations. ADB will continue to help the government corporatize state-owned energy enterprises when needed and improve their efficiency and operational capacity.

18. **Capacity development and institutional support.** The government's capacity needs to be improved if it is to carry out its new policies and master plans successfully. ADB will continue to help enhance the government institutions and build its abilities in (i) developing and implementing policies, plans, and laws; (ii) research and statistical, technical, and engineering work; (iii) financial management and economic evaluation; (iv) public-private partnership management; and (v) environment impact assessment and social impact assessment to ensure that energy resources are developed sustainably.

19. Because support from development partners and the private sector in power generation is substantial, ADB will focus its sovereign operations on power network expansion and increasing electrification through a long-term programmatic approach. ADB's nonsovereign operations will explore opportunities to support private sector power generation initiatives.

20. The ADB's program to support Myanmar's power subsector is planned for the period 2016–2018. The program will build on ADB's existing portfolio and start by concentrating on the expansion and strengthening of transmission networks. It will also address the strong need for rural electrification by helping to expand the electric power grid, as well as the off-grid power supply in areas where renewable energy sources can be developed. Cross-border power transmission projects will be considered under Greater Mekong Subregion initiatives and plans and activities of the Association of Southeast Asian Nations. ADB will align its assistance with the priorities the government has set in its existing energy plans and others it may identify under policies it is currently preparing.

Problem Tree for Energy Sector



Sector Results Framework (Energy, 2013–2020)

Country Sector Outcomes		Country Sector Outputs		ADB Sector Operations	
Outcomes with ADB Contribution	Indicators with Targets and Baselines	Outputs with ADB Contribution	Indicators with Incremental Targets	Planned and Ongoing ADB Interventions	Main Outputs Expected from ADB Interventions
Increased reliability and accessibility of electricity services for industrial, commercial, and residential consumers	Electrification rate increased to 35% by 2016 (2013 baseline: 31%)	<ul style="list-style-type: none"> Energy system expanded, improved, and well-managed 	<ul style="list-style-type: none"> (i) Targeted operational capacity for domestic consumption to exceed 4,000 MW by 2016 (2013 baseline: 3,735 MW) (ii) 80% of planned 247 km of 500 kV transmission line between Belin and Taungoo to be established by 2020 (2013 baseline: 0 km) (iii) Power distribution loss reduced to 14.2% by 2020 (2013 baseline: 18.2%) 	<p>Planned key activity areas</p> <ul style="list-style-type: none"> (i) Electric power transmission, electric power distribution, rural electrification, distribution loss reduction (ii) Solar, small hydro, biomass, and other renewable energy (iii) Policy and regulation, public–private partnership, sector-wide approaches, and market promotions <p>Planned projects</p> <ul style="list-style-type: none"> (i) Power Transmission Improvement Project (\$80 million, 2015) (ii) Second Power Transmission and Distribution Improvement Project (\$73 million, 2017) (iii) Project preparatory TA (\$1.5 million, 2015; \$2.0 million, 2016) <p>Ongoing projects</p> <ul style="list-style-type: none"> (i) Power Distribution Improvement Project (\$60 million) (ii) Off-Grid Renewable Energy Demonstration Project (capacity development TA, \$2 million) (iii) Policy advisory, capacity development, and regional TA projects 	<p>Planned key activity areas and projects in the pipeline</p> <ul style="list-style-type: none"> (i) Four 230 kV/132 kV SSs and 16.8 km of transmission lines in Yangon constructed (ii) 66 kV and 33 kV SSs and distribution lines rehabilitated or established <p>Ongoing projects</p> <ul style="list-style-type: none"> (i) Seven 66 kV SS, 27 33 kV SSs, 7 km of 33 kV line, 160 km of 11 kV line, 667 km of LV line constructed (ii) 0.25 MW of renewable energy-based minigrids (mostly solar PV and biomass-based systems) developed (iii) At least 10,000 people in rural areas gain access to electricity (iv) Revised electricity regulation prepared (v) ERC proposed (vi) Key energy policies and plans prepared

ADB = Asian Development Bank, ERC = Electricity Regulatory Commission, km = kilometer, kV = kilovolt, LV = low voltage, MW = megawatt, PV = photovoltaic, SS = substation, TA = technical assistance.

Source: ADB estimates.