SECTOR ASSESSMENT (SUMMARY): ENERGY

A. Sector Road Map

1. Sector Performance, Problems, and Opportunities

1. The Constitution of Nepal highlights the need to pursue a policy to deliver a cheap and reliable supply of energy and to use it appropriately to meet the basic needs of citizens. The Government of Nepal has long recognized the development of its large hydropower potential as an important cornerstone of its poverty reduction and economic growth strategy. It has viewed this as a means to (i) provide clean energy that enhances economic activities in rural and urban areas; and (ii) generate revenue from exporting energy.

2. Nepal Electricity Authority (NEA) is the national utility responsible for generation, transmission, and distribution of electricity in the country. The performance of Nepal's energy sector has gradually improved in terms of reduced load shedding; improved capacity and availability; increased access to modern electricity; and increased private sector participation, especially for hydropower generation. While there is no significant gap between electricity demand and supply, the transmission and distribution systems need further strengthening to increase network capacity and redundancy, and eliminate any bottlenecks between generation hubs and load centers. Also, although 78% of the population in Nepal has access to grid-supplied electricity, the distribution systems require immediate upgrading and expansion to improve the reliability and quality of supply, and to facilitate expected future demand growth. These investment requirements until 2030 are beyond the budgetary resources of the government. At the same time, the investment environment in the sector, including regulation, is not sufficiently mature to attract private sector capital and participation at the level required, particularly for transmission and distribution. The challenge for the energy sector is to increase investment and transform in an environment governed by a weak regulatory process.

3. **Generation.** The peak electricity demand of Nepal was about 1,500 megawatts (MW) in 2018 while the total installed generation was only about 1,150 MW. Of the total installed capacity, NEA owned about 600 MW (generating 33% of total electricity sales) and private investors about 550 MW (generating 29% of total electricity sales). This gap between the demand and supply of electricity particularly widens during dry winters (October to March) because of the dominance of run-of-river hydropower plants and the lack of hydropower plants with sufficient storage capacity. To minimize the gap resulting from lower generation and the growing demand for electricity, Nepal imports up to 400 MW of power from India. The government has set the target of generating 15,000 MW by 2027, and it has issued survey licenses for 302 projects with a total capacity of 15,885 MW, of which construction is ongoing for 4,642 MW. Power purchase agreements have been completed for 244 projects with a total capacity of 4,138 MW. The completion of these projects will increase electricity supply in Nepal.

4. **Transmission.** Transmission lines of different voltage levels totaling 3,990 circuit-kilometers and substations with a total capacity of 3,935 megavolt-amperes are operational across the country. About 3,023 circuit-kilometers of new transmission lines and substations with total capacity of 9,500 megavolt-amperes are under construction, but even the completion of this additional capacity would not be sufficient to meet demand. Inadequate transmission infrastructure has been a bottleneck in attracting greater investment in new hydropower development by independent power producers, the private sector companies permitted by law to generate electricity in Nepal. Therefore, the government has given high priority to building new transmission lines and substations. The Fourteenth Three-Year Plan, fiscal year (FY) 2017–FY2019

aimed to add 785 kilometers by FY2019.[1] These targets were not achieved mainly because of delays in the acquisition of land along the rights-of-way, delays in forest clearance, and inadequate project management during execution. The timely completion of transmission lines under construction and those planned in the future will be key to developing Nepal's hydropower resources. These will facilitate delivery of electricity from generation sites to load centers and strengthen in-country transmission systems that will eventually support cross-border power exchange with India.

5. **Distribution.** NEA, which serves more than 3.9 million customers nationwide, has major responsibility for electricity distribution. Besides NEA, Butwal Power Company supplies electricity to about 50,000 customers, and 281 community-based rural electrification entities have electrified about 0.5 million households. NEA's domestic customers account for 94% of its customer base but only contribute 38% of total sales, while its industrial customers account for only 1.4% of its customer base but contribute 40% of total sales.[2]

6. High system losses and inadequate tariffs have resulted in NEA's poor financial health. However, NEA's efforts—including upgrading and rebuilding distribution feeders and low-voltage distribution lines with high system losses, implementing smart meters, and undertaking a loss-reduction campaign with penalties for errant users—reduced system losses from 22.9% in FY2017 to 15.4% in FY2019. NEA achieved an operational surplus, with profit reaching record highs of Nepalese Rupees (NRs) 1.5 billion in FY2017 and NRs2.9 billion in FY2018; prior to this, its last operational surplus was recorded in FY2007.

7. **Rural electrification.** The government's efforts on rural electrification are primarily implemented by NEA. The Alternative Energy Promotion Centre, an agency under the Ministry of Energy, Water Resources and Irrigation responsible for renewables and off-grid applications, is implementing rural electrification in remote locations through off-grid decentralized renewable energy systems. Rural electrification requires a relatively higher investment per customer than providing electricity to urban customers. Electricity sales to rural customers are too low, leading to a revenue imbalance and little interest from NEA to expand rural electrification. The government aims to achieve a universal electrification rate of near 100% by 2027, up from 78% in 2018, which requires (i) regulatory frameworks to (a) create commercial incentives for the public sector, and (b) establish a viable business model for private investment in electricity network expansion; and (ii) decentralized energy solutions. Regulatory reform is also required to address issues with the operation and maintenance of decentralized systems.

8. Promulgation of the Nepal Regulatory Commission Act, 2017 provided an important sector reform stepping-stone for the government. Through this legislation, the government effectively removed itself from direct regulation of the energy sector, particularly with respect to tariff setting and consumer protection. The Electricity Regulatory Commission has been operational since mid-May 2019 and is preparing to assume increased responsibility as the principal independent regulatory body for electricity. The government and NEA are proceeding with structural unbundling and creation of separate entities for generation, transmission, distribution, and power trading, and the complex task of devolution of responsibility for electricity distribution to provisional authorities is underway. Scientific assessment of disaggregated technical and commercial losses, and a time-bound plan and investment are required to further reduce the loss level to make it comparable with international best practices. Expansion and upgrading of the distribution system are also equally important, as the distribution infrastructure is not adequate to deliver power to

[1] Government of Nepal; National Planning Commission. 2017. *Fourteenth Three-year Plan*. Kathmandu. https://www.npc.gov.np/images/category/14th-plan-full-document.pdf

[2] Nepal Electricity Authority. 2020. *Annual Report 2019/20.* Kathmandu. https://www.nea.org.np/annual_report

end consumers in safe and reliable ways. NEA has been receptive to adapting new technologies (such as smart grids, large-scale solar energy development, and energy efficiency) to transform itself into a modern and efficient utility.

2. Government's Sector Strategy

9. The government's policy initiatives in the energy sector include the Electricity Act of 1992, which was adopted to develop and manage the hydropower regime in Nepal, and to standardize and safeguard electricity services. This was followed by the Hydropower Development Policy of 2001, which listed objectives and laid down governing rules for the hydropower subsector. The National Water Resource Strategy, 2002 called for NEA to become commercially viable through corporatization, improved management, and separation of its rural electrification operations. In 2019, the government published draft amendments to the Electricity Act, 1992 for public comment; these amendments seek to address structural unbundling of NEA into separate entities for electricity generation, transmission, and distribution (among other things).

10. To improve energy sector performance, the government has introduced immediate and long-term strategies. In 2008, the government approved the National Electricity Crisis Resolution Action Plan. In December 2008, the government formed a task force to prepare a road map for developing an additional 10,000 MW of hydropower generation capacity by 2028. In February 2016, a cabinet meeting endorsed an action plan for ending the electricity supply deficit by 2018. The action plan consists of 99 activities covering (i) legal reform provisions, (ii) policy decisions, (iii) administrative decisions and procedural reforms, and (iv) structural provisions and reforms. The government also issued its People Investment in Nepal Hydropower strategy in September 2016, outlining 37 specific medium- and long-term actions for electricity sector development. In 2018, the government issued a comprehensive white paper highlighting the existing situation and issues, and outlining a future road map for the energy sector, and water resources and irrigation.[3] The white paper covered several actions for (i) increasing per capita energy consumption by 700 kilowatt-hours (kWh) per year within 5 years (i.e., by 2023) and 1,500 kWh per year in 10 years (i.e., by 2028); (ii) developing 15,000 MW in 10 years (i.e., by 2028) with one mega-project in each state with opportunities for public equity financing; (iii) developing in-country and new cross-border transmission line projects; (iv) resolving right-of-way issues during the construction of transmission lines; (v) providing access to electricity for all within 5 years (i.e., by 2023); (vi) modernizing the electricity distribution system; and (vii) developing the market for power trading.

11. Other government initiatives to develop the energy sector include the Rural Energy Policy, of 2006, the Renewable Energy Subsidy Policy of 2012, and the Biomass Strategy of 2017. These initiatives aimed to reduce dependency on traditional energy and conserve the environment by developing decentralized rural energy solutions intended to increase employment, productivity, and living standards of the rural population. The Electricity Regulatory Commission aims to promote and protect competition, promote transparency, and advocate for consumers' rights. The focus of Nepal's power system investment program is now gearing toward delivering a reliable and high-quality supply of electricity to all domestic consumers and exporting excess electricity.

B. Major Development Partners: Strategic Focus and Key Activities

12. The energy sector in Nepal continues to receive substantial assistance from various international development partners. The Asian Development Bank (ADB), European Investment

[3] Government of Nepal; Ministry of Energy, Water and Irrigation. 2018. *Present Situation and Future Roadmap of Energy, Water Resources and Irrigation Sector (White Paper).* Kathmandu.

Bank, and World Bank have been the major sources of multilateral funding to the sector, focusing on expansion and upgrading of generation, transmission, and distribution facilities; development of renewable energy resources; and support for sector reforms. Bilateral development partners with energy sector activities include the Department for International Development of the United Kingdom, German development cooperation through Deutsche Gesellschaft für Internationale Zusammenarbeit and KfW, the Government of India, the Government of Norway, the Government of the People's Republic of China, the Japan International Cooperation Agency, the Government of the Republic of Korea, the Kuwait Fund for Arab Economic Development, the Millennium Challenge Corporation, the Saudi Fund for Development, and the United States Agency for International Development.

Major Development Partners

Development Partner	Project Name	Duration	Amount ($ million)
ADB	Electricity Grid Modernization Project	2021–2026	156.0
MCC	Millennium Challenge Impact Nepal (transmission line, road)	2019–2025	500.0
World Bank	Development Policy Credit – Energy	2018–2020	100.0
ADB and Government of Norway	South Asia Subregional Economic Cooperation Power Transmission and Distribution System Strengthening Project	2020–2025	235.0
ADB	Power Transmission and Distribution Efficiency Enhancement Project	2016–2021	150
ADB	Solar Energy Development (Additional Financing)		20.0
World Bank	Grid Solar and Energy Efficiency Project	2015–2020	130.0
ADB and Government of Norway	South Asia Subregional Economic Cooperation Power System Expansion Project	2014–2021	200.0
ADB	Project Preparation Facility for Energy	2013–2020	21.0
ADB	Tanahu Hydropower Project	2013–2020	150.0
JICA	Tanahu Hydropower Project	2013	184.0
World Bank	Kali Gandaki A Hydropower Plant Rehabilitation Project	2013–2017	27.26
ADB and Government of Norway	Electricity Transmission Expansion and Supply Improvement Project	2011–2017	100.0
World Bank	Nepal–India Electricity Transmission and Trade Project	2011–2016	138.0
ADB	Energy Access and Efficiency Improvement Project	2009–2015	65.0
ADB	Electricity Transmission Expansion and Supply Improvement Project	2011–2020	75.0
Government of Norway	Electricity Transmission Expansion and Supply Improvement Project	2011–2020	25.0

ADB = Asian Development Bank, JICA = Japan International Cooperation Agency, MCC = Millennium Challenge Corporation.
Note: This table captures only the key projects, and details might have changed during processing and implementation.
Sources: ADB and Nepal Electricity Authority.

C. Institutional Arrangements and Processes for Development Coordination

13. Enhancing performance of Nepal's energy sector requires simultaneous intervention in policy measures, investment in critical areas, and enhancement of capacity and governance. Sector reform has resulted in good sector performance and will be continued to create a better

enabling environment for private sector participation. Similarly, investment in key infrastructure must be increased to meet immediate requirements and increase private sector participation. Capacity building and governance are integral and will be pursued continuously to sustain sector achievements. These reform areas are getting adequate attention because of joint efforts from the Government of Nepal and development partners. For example, the World Bank and the government are implementing the Development Policy Credit - Energy, which primarily aims to reform the energy sector. Similarly, ADB's projects aim to ease critical infrastructure bottlenecks for better system performance and enhance private sector participation. Likewise, several multilateral and bilateral development partners, along with the government, are pursuing measures in various programs and projects to enhance the capacity of implementing agencies. Informal group meetings of various development partners take place regularly to share progress on implementation of ongoing projects and new initiatives being developed to identify opportunities for collaboration and avoid duplication. Such complementary action demonstrates good institutional arrangements and will be continued to meet the government's targets.

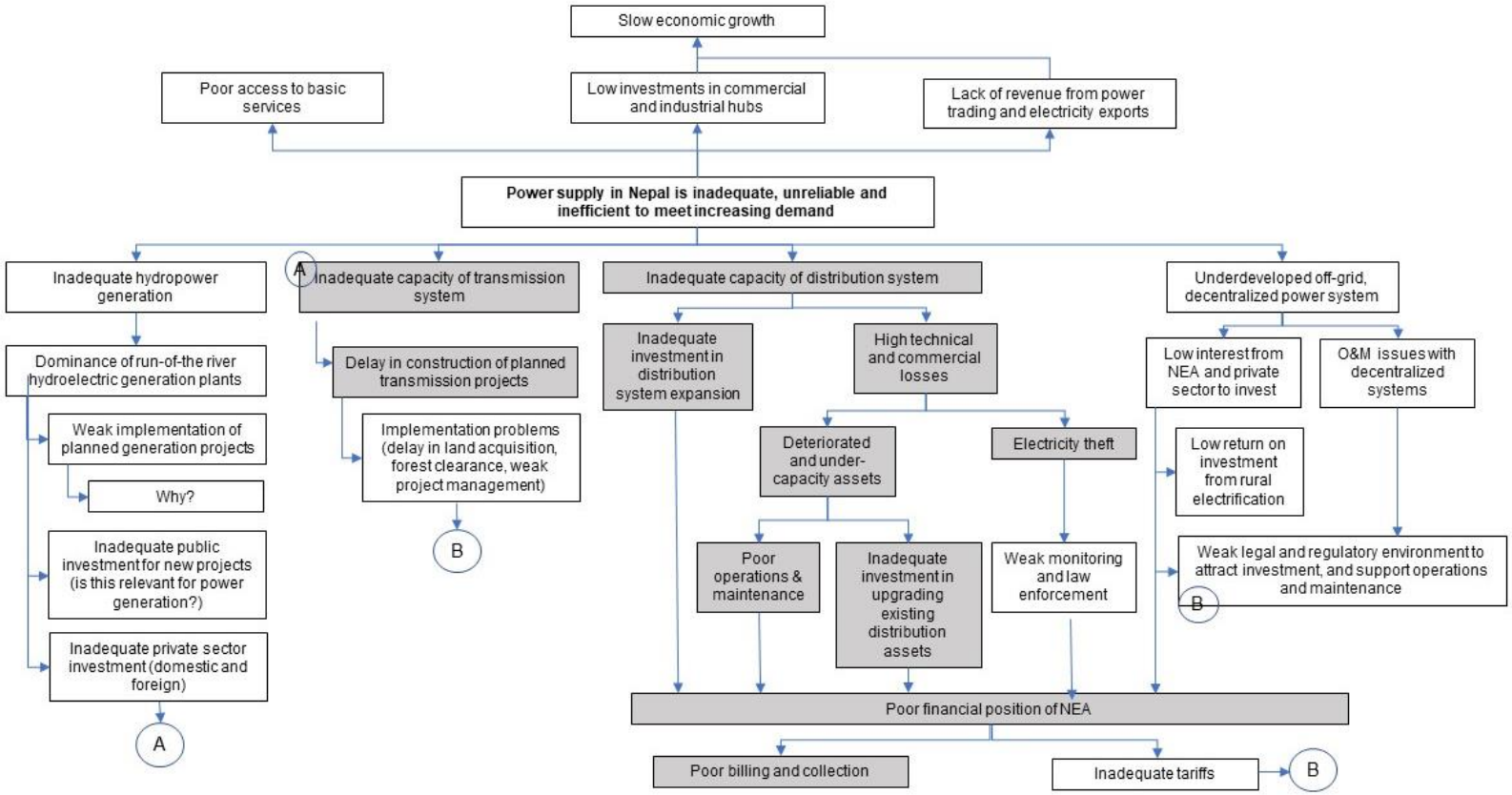
D. ADB Experience and Assistance Program

14. ADB has been a leading development partner in Nepal's energy sector, supporting a broad spectrum of interventions in generation, transmission, distribution, access, and overall sector reforms. The central theme for the energy sector is to contribute to Nepal's development outcomes by achieving energy security at home and developing energy exports. ADB's main focus in its country partnership strategy for Nepal, 2020–2024 is to make the country's energy sector a key driver of inclusive economic growth.[4] ADB's portfolio in Nepal's energy sector amounts to $923 million in sovereign loans and grants, and an additional $117 million in cofinancing. ADB is also pursuing strategic partnerships with other development partners to support the government in providing a wider flow of financial resources and knowledge. Major cofinancing partners include the European Investment Bank, the Japan International Cooperation Agency, the Government of Norway, and the Strategic Climate Fund's Scaling Up Renewable Energy Program in Low Income Countries. ADB is supporting (i) the development of storage hydropower plants, transmission lines, and substations; (ii) the expansion and modernization of distribution infrastructure; (iii) the development of renewable energy and rural energy access; and (iv) energy sector reform. The overall improvements in the energy sector have facilitated commercial investment in the 216 MW Upper Trishuli-1 Hydropower Project with international investment participation, including ADB's nonsovereign financing.

15. Progress toward achieving the desired policy and regulatory environment has been slow in Nepal. The intended policy and regulatory framework catalyzing private sector investment has yet to be achieved, but support from other development partners will help develop critical infrastructure and push for sector reforms in the meantime. ADB's assessment of ongoing projects shows efficiency issues related to implementation delays because of (i) inadequate (albeit improving) project management and internal control systems of executing agencies; (ii) delays in the preparation and implementation of land acquisition and forest clearance; (iii) delays in finalizing technical designs and bidding documents; (iv) insufficient capacity to undertake specific technical tasks, and (v) the need to implement environmental and social safeguard measures. Furthermore, the monitoring and evaluation capacity of executing agencies is considered weak.

[4] ADB. 2019. *Country Partnership Strategy: Nepal, 2020–2024—Promoting Connectivity, Developed Services, and Resilience*. Manila.

Problem Tree for Energy



Legend:

Project Scope

NEA = Nepal Electricity Authority, O&M = operation and maintenance.