

SECTOR ASSESSMENT (SUMMARY): ENERGY (ELECTRICITY TRANSMISSION AND DISTRIBUTION)

Sector Road Map

1. Sector Performance, Problems, and Opportunities

1. **Overview.** The power sector in Bangladesh is characterized by a long-standing shortage of electricity generating capacity and natural gas supply, amidst an increasing demand for power to serve the growing economy and population. The national grid covers the entire country, with two cross-border interconnections with India. As of June 2017, about 83% of the population had access to grid-connected electricity,¹ up from 50% in 2011.² Providing electricity to the remaining population continues to be a major challenge.

2. **Structure of the power sector.** Bangladesh Power Development Board (BPDB) is the single largest institution in the power sector. BPDB (i) accounts for 55% of generating capacity (including generation by BPDB's subsidiary companies, Ashuganj Power Station Company Limited, Electricity Generation Company of Bangladesh, and North-West Power Generation Company Limited); (ii) acts as a single buyer for all generation and bulk supply to distribution utilities; and (iii) supplied retail power to end-use customers comprising about 20% of total electricity sales, as of fiscal year (FY) 2017 (ended June 2017). The balance of generation comes from the Bangladesh Rural Electrification Board (BREB) through its *palli bidyut samitis* (PBSs) (rural electricity cooperatives), independent power producers (IPPs), short-term IPPs, and rental power plants. Power Grid Company of Bangladesh (PGCB) is the transmission utility, owning and managing the transmission network and substations at 132 kilovolts (kV), 230 kV, and 400 kV. Bulk power sold by BPDB at its transmission substations to distribution companies in FY2017 was in the following proportions: Dhaka Power Distribution Company (DPDC), 16%; Dhaka Electricity Supply Company (DESCO), 9%; Western Zone Power Distribution Company, 5%; BREB, 45%; and Northern Electricity Supply Company Limited (NESCO), 5%. The balance of electricity sold (20%) is distributed by BPDB (footnote 2).

3. **Power generation situation.** The country has experienced a shortage of power generation capacity since 2000 because of (i) the inability to build new generation capacities through timely investments, (ii) poor maintenance and performance of the existing generating capacity, (iii) natural gas supply shortages to operate some of the gas-fired power plants, and (iv) rapid growth in demand for electricity because of fast economic growth. The peak demand was estimated to be 2,500 megawatts (MW), of which 530 MW were not served, resulting in load shedding. As of June 2017, the total nationwide dependable grid-connected generation capacity was 9,479 MW, against an estimated peak demand of 10,400 MW; the balance was met with supply from captive generation and through load shedding.³

4. **Power generation outlook.** The government's Power System Master Plan 2016 estimated peak demand to reach 13,300 MW by 2020 and 19,900 MW by 2025.⁴ Therefore, to meet annual demand growth of about 13% during 2018–2020 and 10% during 2020–2030, about 25,000 MW of new generating capacity is required to be added during 2018–2030.

¹ Government of Bangladesh; Ministry of Power, Energy and Mineral Resources; Power Division; Power Cell. [Bangladesh Power Sector at a Glance](#).

² BPDB. 2018. *Annual Report, 2016–2017*. Dhaka.

³ BPDB estimates that load shedding at peak times in FY2017 was about 250 MW.

⁴ Government of Bangladesh; Ministry of Power, Energy and Mineral Resources. 2016. *Power System Master Plan 2016*. Dhaka.

5. **The transmission network.** Bangladesh's national grid covers the entire country and operates at 132 kV, 230 kV, and 400 kV. The country's transmission system is connected to the national grid of India through 400 kV lines at Bheramara and Comilla. The first 400 kV transmission line, from Meghnaghat to Aminbazar, is currently in operation, further strengthening the transmission network. Three other 400 kV transmission lines (Bibiyana–Kaliakoir, Ashuganj–Bhulta, and Mongla–Aminbazar) are under construction. A 230 kV transmission ring exists around Greater Dhaka, and a larger 230 kV ring connects the main cities in central Bangladesh. Among the zones of south, southwest, northwest and southeast, east and northeast of Bangladesh, at present, two 230 kV transmission systems connect the western and eastern parts of Bangladesh. The rest of the transmission network operates at 132 kV. By June 2017, there were 560 circuit-kilometers (km) of 400 kV lines, 3,325 circuit-km of 230 kV lines, and 6,551 circuit-km of 132 kV lines.

6. The single buyer, BPDB, purchases electricity from generation licensees and sells to distribution licensees using the transmission network owned and operated by PGCB, for which PGCB is paid a wheeling charge (i.e., a transmission system use fee). PGCB transferred 41,200 gigawatt-hours (GWh) in FY2015, 47,759 GWh in FY2016, and 50,846 GWh in FY2017 at the wheeling charge of Tk0.27 per kilowatt-hour.⁵

7. **Transmission performance.** The technical performance of the transmission network has been improving since 2000. The availability of transmission lines and grid substations has exceeded 99.9% as of FY2016 (footnote 5). The number of interruptions throughout the transmission network due to transmission system issues increased from two interruptions in FY2016 to 15 interruptions in FY2017, with the cumulative duration of outages increasing from almost 17 hours to 39 hours. In FY2017, PGCB reported one partial grid failure. The reported transmission losses declined from 4.9% to 2.7% during FY2000–FY2017.

8. **Transmission outlook.** The ranges of operating voltages at many transmission substations at peak times are not within the plus or minus 5% under steady state or plus or minus 10% under emergency state. The reliability requirement of a single outage (n-1 condition)⁶ is not available in many lines and substations throughout the network. While there is no significant overloading on the network, many lines are operating at their thermal capacity or will reach their capacity limits around 2020. With regard to generation development, the transmission network requires strengthening to transfer power reliably to the load centers. As gas-fired generation and planned coal-fired generation is largely outside the key load centers (such as Dhaka), much of this generation has to be transferred over long distances exceeding 200 km. The relatively high transmission loss level of 2.7% reported in FY2017 also indicates room for further improvement.

9. Many transmission system expansion and capacity improvement projects that have been planned by PGCB are ongoing to relieve existing system constraints and to facilitate electricity transmission from power plants that are under construction and planned. Several significant ongoing projects include the following: (i) capacity enhancement by 500 MW of the existing Bangladesh (Bheramara)–India (Baharampur) grid interconnection by upgrading capacities of infrastructure on both ends; (ii) the National Grid-2 project that includes construction of a 168.4 km 400 kV double-circuit transmission line from Bibiyana to Kaliakoir, construction of a 33.2 km 230 kV double-circuit transmission line from Fenchuganj to Bibiyana, and construction and upgrading of substations in Bibiyana, Kaliakoir, and Fenchuganj; (iii) the National Grid-3 project that includes construction of a 174 km 400 kV double-circuit transmission line from Aminbazar to Mongla

⁵ PGCB. 2017. *Annual Report, 2016–2017*. Dhaka.

⁶ n-1 is a reliability benchmark, where the transmission system is planned to ensure stable operation if any one component of the network (e.g., a line, a transformer, or any single piece of equipment) fails. If this were to occur, the transmission system would continue to operate under normal conditions of service, with no impacts on the continuity or quality of supply to customers.

(including a 9.4 km river crossing across Padma River) and augmentation and upgrading of the existing 230/132 kV substation at Aminbazar to a 400/230/132 kV substation; (iv) 70 km Ashuganj–Bhulta 400 kV double-circuit transmission line (including two line-in, line-out connections), and a 400 kV/230 kV air-insulated switchgear grid substation at Bhulta; and (v) the national power transmission network development project that includes a 75 km 230 kV transmission line, a 182 km 132 kV transmission line, two 230 kV/132 kV substations, and 11 132 kV/33 kV grid substations.

10. PGCB has 21 more projects in its 2017 transmission system development plan to expand and enhance the transmission system. These 21 projects include Bangladesh's first-ever 765 kV transmission line project and a 100 km double-circuit line from Madunaghat to Maheskhali. Other planned projects will expand the 400 kV network by more than 1,000 km, and increase 230 kV and 132 kV transmission line lengths significantly. In addition, these 21 projects will add a number of 400 kV, 230 kV, and 132 kV grid substations while augmenting the capacity of many existing substations.

11. **Power distribution.** The power distribution is done by six distribution utilities: (i) BPDB, (ii) DPDC, (iii) DESCO, (iv) West Zone Power Distribution Company, (v) BREB (which included 80 PBSs as of June 2017), and (vi) NESCO. The total number of customers covered by these six distribution utilities was about 27.4 million as of 2017 (footnote 1). Distribution losses of BPDB, DPDC, and DESCO ranged from 25% to 35% between 1980 and 1992. As of 2017, the distribution losses of DESCO, DPDC, and West Zone Power Distribution Company had reached below 10%, while those of BPDB, BREB, and NESCO ranged from 10% to 12%. Two main factors that contributed to this improvement were upgrading overloaded components and reducing commercial losses.

12. **Market structure.** About 50% of electricity sold in Bangladesh was to residential customers in FY2017. The industry sector purchased 36% of the total sales, followed by the commercial sector (9%), agriculture sector (3%), and others (2%). The average annual sales growth rate was 9% during 2005–2015. It should be noted that many industries operate on captive diesel or gas generators to avoid impacts of frequent load shedding.

13. **Regulatory framework.** Bangladesh Energy Regulatory Commission (BERC), which became fully operational in 2008, is the regulatory agency that regulates gas, electricity, and petroleum products. BERC's first major regulatory order, issued in 2008, revised the electricity bulk supply tariffs for distribution utilities. In February 2011, BERC announced a further upward revision of electricity bulk supply tariffs and retail tariffs. By 2015, BERC had revised the electricity bulk supply tariff, transmission tariff, and retail tariffs.

14. **Implementation of tariff policy and sector challenges.** Tariff submissions and tariff determinations need to be conducted at more regular and predictable intervals. The tariff submission interval for transmission and distribution entities can be from 3 to 5 years, with automatic adjustments for (i) inflation, (ii) efficiency improvement, (iii) additional capital expenditure incurred, and (iv) planned capital expenditure deferred. It is required by the tariff policy that the costs of BPDB be passed through from generation to transmission, onward to distribution, and then to the customer. Owing to the absence of such automatic tariff adjustments, significant recurring cash deficits prevail in BPDB, which is the largest entity in the sector, and in other entities as well. BPDB reported an operating loss of about Tk16,000 million in FY2017, a 16% increase over the previous FY. Restoring the financial stability of sector institutions remains a challenge to be overcome through regular tariff revisions, as provided in BERC's mandate. BPDB's revenue gap in FY2017 was 5.6% of its income to reach the breakeven level. After several years of declining profits, PGCB reported a profit after tax of about Tk7,000 million in FY2017, largely owing to the increased wheeling charge applied from FY2016. Regular tariff reviews would enable

PGCB's financial performance to be improved to levels that would enable it to provide an improved service and to finance its future investments, especially in face of the large investments required to interconnect upcoming generating assets to the grid.

2. Government's Sector Strategy

15. **National strategy and policies.** The government's near- to medium-term broad strategy for the energy sector is described in its Vision 2021 plan and further elaborated in its Seventh Five Year Plan.⁷ From 1996 onwards, under its National Energy Policy, the government has undertaken a series of reforms to introduce competition, attract foreign direct investment, and increase power supply. Key policies, legislation, and guidelines include the following: (i) Private Sector Power Generation Policy of Bangladesh, adopted in 1996; (ii) Policy Guidelines for Small Power Plants in Private Sector, adopted in 1998; (iii) Guidelines for Remote Area Power Supply Systems, adopted in July 2007; (iv) Policy Guidelines for Enhancement of Private Participation in the Power Sector, adopted in 2008; (v) Renewable Energy Policy of Bangladesh, adopted in January 2009; (vi) the BEREC Act, 2003; (vii) the unbundling of generation, transmission, and distribution functions into separate companies starting in 1991, and (viii) the policy paper issued by the Finance Ministry titled, "Towards Revamping Power and Energy Sector: A Road Map 2010."⁸

16. **Sector reforms outlook.** The government has delayed further institutional reforms in the power sector, including (i) converting BPDB into a holding company and (ii) establishing a single buyer other than BPDB for purchasing electricity from public sector generation plants and IPPs, and selling it to power distribution companies. Such reforms have not been implemented for a significant period of time, and further liberalization of the industry under the reforms and unbundling implemented in previous years (para 15) is yet to be implemented.

3. ADB Sector Experience and Assistance Program

17. As Bangladesh's lead development partner in the energy sector, the Asian Development Bank (ADB) has provided support in seven broad thematic areas: (i) promoting a commercial orientation for power sector entities, (ii) promoting investments in power generation, (iii) removing transmission constraints, (iv) expanding access to electricity, (v) increasing gas production capacity and mobilizing investments to gas production, (vi) improving the gas transmission and distribution network, and (vii) improving the governance and regulatory framework. ADB has assisted the government in implementing all aspects of power sector reforms. Under the country partnership strategy for Bangladesh, 2016–2020, ADB continued its support for power sector reform and focused on improving governance across the sector and in key sector entities.⁹

18. ADB's support in Bangladesh's energy sector will build on the progress made in power sector reforms and respond promptly to the growing power shortage. In the power sector, this will involve (i) supporting policy, legal, and regulatory reform to create an enabling business environment for the private sector; (ii) implementing power transmission interconnections with India; (iii) investing in new power-generating facilities and rehabilitating old power plants for improved efficiency; (iv) increasing investment in clean energy such as wind and solar power through public–private partnerships; and (v) strengthening the transmission network to accommodate expected additions to generating capacity.

⁷ Government of Bangladesh, Ministry of Planning, Planning Commission. 2012. *Perspective Plan of Bangladesh, 2010–2021: Making Vision 2021 a Reality*. Dhaka; and Government of Bangladesh, Planning Commission. 2015. *Seventh Five Year Plan, FY2016–FY2020: Accelerating Growth, Empowering Citizens*. Dhaka.

⁸ Government of Bangladesh, Prime Minister's Office Library. <http://lib.pmo.gov.bd>.

⁹ ADB. 2016. *Country Partnership Strategy: Bangladesh, 2016–2020*. Manila.

Problem Tree for Energy (Electricity Transmission and Distribution)

