SECTOR ASSESSMENT (SUMMARY): POWER

A. Power Generation

1. The energy sector in Bangladesh is characterized by an acute shortage of generating capacity, amidst an increasing demand for power to serve the growing economy and to provide the essential needs of the population that is yet to be served with grid electricity. The national grid of Bangladesh generally covers the entire country. There are no major interconnections to neighboring countries, although a 500 megawatt (MW) interconnection with India is under construction. Total sales in 20111 were 26.6 terawatt-hours (TWh), indicating one of the lowest per capita consumption rates in the world (180 kilowatt-hours [kWh] per person per year). Only about 50% of the population has access to electricity; the major challenge faced by the sector is to provide modern energy services to the remaining half of the population.

2. The Bangladesh Power Development Board (BPDB) is the largest single institution in the energy sector, with 53% of generating capacity, which includes generation by BPDB subsidiary companies—the Northwest Power Generation Company and the Electricity Generation Company Limited of Bangladesh. The BPDB performs the functions of the single buyer of all generation, and bulk supply to distribution utilities. The balance of generation capacity is provided by independent power producers (IPPs), short-term IPPs, and rental power plants. The Power Grid Company of Bangladesh (PGCB) is the transmission utility, owning and managing the transmission network and 132 kilovolt (kV) and 230 kV substations. Purchasing bulk power from BPDB at transmission substations, the distribution companies each delivered the following share of total bulk sales in 2011: Dhaka Power Distribution Company (DPDC) 21%, Dhaka Electricity Supply Company (DESCO) 11%, Western Zone Power Distribution Company 6%, and the Rural Electrification Board (REB) 36%. The remaining 25% of power was distributed by the BPDB.

3. The country has been facing a severe shortage of power for over two decades. The reasons are broadly identified as (i) the inability to build new capacity commensurate with growing demand, (ii) poor maintenance and performance of available power plants, (iii) gas shortages limiting operation of some power plants, and (iv) rapid growth in demand for electricity. By the end of 1995, the installed capacity was 2,900 MW, but because of poor maintenance the available capacity in 1995 was limited to about 2,130 MW. The unconstrained demand at peak time was estimated to be 2,400 MW, of which 870 MW was not served, resulting in significant load shedding. This situation of inadequate installed capacity as well as operational capacity in the face of growing demand continued throughout the 1990s. By 2000, the unconstrained demand had risen to 3,550 MW, of which about 500 MW had to be shed. The installed power generation capacity had further increased to 6,639 MW by June 2011, but available capacity for serving peak demand was 4,890 MW. About 30% of peak demand may have been shed in 2011.

4. In 2011, 73% of installed capacity in Bangladesh was natural-gas-fired generation, with diesel, fuel oil, and coal accounting for 24%, and hydropower accounting for 3% of generation capacity. These power plants produced 31.3 TWh in 2011, of which 82% was from natural-gas-fired power plants. Most gas-fired power plants have either open cycle or combined cycle gas turbines. Of the 6,639 MW of installed generating capacity, 2,900 MW capacity was from private power plants serving the grid either through long-term contracts or short-term rental contracts. Of the balance (3,739 MW), 3,503 MW is owned by the BPDB and 236 MW by the REB. The private generators consist of six IPPs with total capacity of

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1 Throughout this document, any "year" refers to the financial year ending 30 June of that year, e.g., 2011 means 1 July 2010 to 30 June 2011.
1,231 MW, supplying power to the BPDB and REB under long-term power purchase agreements; 10 small-scale IPPs (less than 35 MW) with total capacity of 220 MW; and 1,679 MW of generation capacity procured on a short- to medium-term basis under rental arrangements.

5. Although 78% of the BPDB’s generation capacity is gas-fired and has the potential to reach a high thermal efficiency exceeding 50%, the reported thermal efficiency of all the BPDB thermal power plants (including those of BPDB subsidiary companies) in 2011 was relatively low (31%), indicating the possibilities for efficiency improvements through immediate and long-term strategies. One key reason for this low thermal efficiency is that only a few of the gas-fired power plants are of combined cycle type; others have open cycle combustion turbines and steam turbines, typically of 28%–35% efficiency. The average capacity factor for the BPDB power plants was 50% in mid-2011, indicating a high incidence of nonavailability because of maintenance outages, fuel supply shortages, and dispatch constraints. Only a few of the major power generation units reported a capacity factor above 75% in 2011: Ghorasal steam turbines 3 and 4 (360 MW, 75%), Fenchugang combined cycle (90 MW, 77%), and Baghabari gas turbines (100 MW and 71 MW, 78%). Major power generating units that should have operated at a high capacity factor (exceeding 75%) operated well below 50%, notably the Ghorasal steam turbines 5 and 6 (360 MW), which operated at 40%.

6. The Government of Bangladesh has taken initiatives to reduce the widening demand–supply gap in the energy sector. During 2007–2011, generation capacity increased by 2,900 MW, 1,850 MW of which was added by the private sector. Total investments in generation in this period were about $1.2 billion, and in transmission $600 million. According to the Sixth Five Year Plan, (FY2011–FY2015) of the government, about 12,567 MW of generation capacity additions are required to eliminate the supply–demand gap and to increase access to 68%. The Government of Bangladesh has developed a multifaceted policy which aims to address the need to increase the power supply for the country’s economic and social development. The National Energy Policy of 2008 establishes the key guidelines for sector targets, investment, and management to

(i) provide adequate and secure energy resources for all,
(ii) support socioeconomic development,
(iii) reduce poverty and ensure social equity,
(iv) provide a sustainable energy mix,
(v) promote rational use of energy,
(vi) improve sector management and performance,
(vii) increase private sector investment,
(viii) ensure balanced growth of the eastern and western zones of the country, and
(ix) promote regional energy markets.

7. In particular, the policy statements emphasize the desire of the government to improve sector management and performance, and to increase private sector investment.

8. The existing gap between supply and demand for power is likely to remain for several years given the growing demand of existing and new customers in already electrified areas, the release of suppressed demand when load shedding and transmission and distribution constraints are relaxed through new investments, and the demand from new customers as rural electrification expands. Power shortages have constrained potential economic growth in Bangladesh and the cost of power outage has been estimated to be about 0.5% of gross

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domestic product. The government plans to add about 9,000 MW of generation capacity during 2011–2015 under its aggressive generation expansion program. Of this, about 3,500 MW is in various stages of construction and procurement (752 MW of which was commissioned in 2011), and 2,250 MW is under procurement. Under other initiatives to mitigate the demand–supply gap, procurement has commenced for 530 MW of rental IPP capacity and 820 MW of peaking power plant capacity to be developed by the public sector. Under its latest initiative, the government has identified about 4,000 MW to be installed on a build–own–operate basis by 2015.

9. Bangladesh has limited hydroelectric potential; hydropower presently provides 230 MW of capacity, producing 875 GWh/year (3% of total). It is estimated that nonconventional renewable sources of power generation such as wind and biomass currently provide about 20 MW of capacity, largely off-grid. It is estimated that about 15 MW of solar photovoltaic capacity is used in households with no grid connection. Under the latest draft National Energy Policy, renewable energy is expected to provide 5% of installed capacity by 2015 and 10% by 2020. Under this policy, the BPDB is in the process of developing 100 MW of wind and 9–14 MW of grid-connected solar capacity through public–private partnerships. A 5 MW solar photovoltaic generating facility is in the final stages of planning, and is due for commissioning in 2013. The BPDB has already developed 2 MW of wind capacity under two pilot projects. There are also a number of small-scale off-grid wind installations. Solar home systems (SHSs) have been used extensively for electrification in rural areas. The Infrastructure Development Company (IDCOL) has supported nongovernment organizations in installing SHSs in more than 600,000 households, and Grameen Shakti, associated with the Grameen Bank, has installed more than 180,000 SHSs. There has also been extensive development of small-scale biogas applications. Since June 2006, IDCOL has constructed more than 10,000 biogas plants in rural areas under the National Domestic Biogas and Manure Program.

B. Power Transmission and Distribution

10. Bangladesh’s power transmission system consists of 132 kV and 230 kV transmission networks (one 400 kV transmission line is also under construction). Two 230 kV systems connect the western and eastern parts of the country. A 230 kV transmission ring exists around Greater Dhaka; a larger 230 kV ring connects main cities in central Bangladesh; and a 230 kV connector links south, southwest, and northwest Bangladesh. The rest of the transmission network operates at 132 kV. The 230 kV lines total 2,647 circuit-kilometers and the 132 kV lines total 5,969 circuit-kilometers. A 500 MW interconnection with India is under construction. The PGCB is the agency responsible for high-voltage electricity transmission in the country.

11. The technical performance of the transmission network has been improving since 2000. The number of interruptions throughout the network declined from 173 in 2000 to 109 in 2011, with their cumulative duration falling from almost 147 hours to 136 hours. In 2011, the PGCB reported five partial grid failures with a cumulative duration of 32.5 hours, but no total grid failures were reported. The reported transmission losses over the same period declined from 4.9% to 3.3%.

12. The operating voltages at many transmission substations at peak time are not within the ±5% (steady state) or ±10% (emergency) range of operation. The reliability requirement

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of single outage (n-1 condition)\(^4\) 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 would reach their capacity limits within a few years. With the generation development, the transmission network also requires strengthening to dispatch the generated electricity to the load centers. As gas-fired generation is largely outside the key load centers in Dhaka, much of this generation has to be transferred over long distances (exceeding 200 km). The relatively high transmission loss level of 3.3\% reported in 2011 also indicates room for improvement.

13. The total customer base of the five distribution utilities (para. 2) was about 5.2 million in 2011, and the distribution network totaled 209,902 km. The technical performance of distribution utilities has significantly improved over the past decade. Distribution losses of the BPDB, DPDC, and DESCO were 25--35\% in the 1990s. As of 2011, DESCO’s system losses were reported to be less than 10\%, while those of the BPDB, DPDC, and the Western Zone Power Distribution Company were 10--15\%. Two main factors have contributed to this improvement: upgrading overloaded components, and reducing theft. The REB’s losses have also slightly improved over the past 10 years, from more than 16\% in the 1990s to around 14\% in 2011.

14. About 48\% of electricity sold in Bangladesh is to household customers, a significantly high share. Industries accounted 29\% of total sales, followed by commercial customers (9\%), agriculture (5\%), and others (9\%). The annual average growth in sales was 6.4\% during 2001--2011. It should be noted that many industries operate on captive diesel generators to avoid the impacts of frequent load shedding, within load shedding hours as well as outside such periods, to ensure reliability of supply. Load shedding distorts the market structure and prevents accurate sales information for each type of customer to be accurately reported. Total sales in 2011 were 26.6 TWh and the unserved energy because of load shedding in 2011 was estimated to be about 4.4 TWh.

C. Regulatory Framework and Reforms

15. Regulation of downstream energy is the responsibility of the Bangladesh Energy Regulatory Commission (BERC). The commission was established under the 2003 Energy Regulatory Commission Act but, due to administrative and legal issues, only became functional in 2007 and fully operational in 2008. The BERC comprises a chair and four members, supported by a secretariat. BERC members are appointed by the president on a proposal by the responsible minister. Positions are full-time for a 3-year term with reappointment for one further term permitted. The independence and competence of the BERC are not yet fully proven, and past experience has demonstrated a certain degree of government interference. The enabling act provides for the government to issue policy directives to the BERC and that tariffs are to be determined “in consultation with the Government.” The BERC has also suffered from a lack of internal capacity. It is in the process of procuring technical assistance under World Bank funding to enable it to finalize outstanding tariff regulations and to undertake a full review of electricity tariffs. A lack of capacity has also led to failure to finalize and approve the Grid Code\(^5\) and the Distribution Code. Having these codes in place would help to increase system efficiency as the codes will set minimum standards and maximum allowable operational levels for system components.

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\(^4\) n-1 is a reliability benchmark where the transmission system is planned to ensure stable operation, whereby if any one component of the network (a line, a transformer, or any single piece of equipment) fails, the transmission system would continue to operate under normal conditions of service with no impacts on the continuity or quality of supply to customers.

\(^5\) The Grid Code is a regulatory document describing the role, responsibilities, safety, and rules for investment planning, operational planning, technical standards, and commercial operating guidelines for an electricity transmission network.
16. Under the Energy Regulatory Commission Act, the BERC’s functions are defined as follows. It is to
(i) determine energy efficiency standards and conduct energy audits;
(ii) determine electricity tariffs for electricity generation and transmission, marketing, supply, storage, and distribution of energy;
(iii) issue, cancel, amend, and determine conditions of licenses;
(iv) approve investment schemes on the basis of the overall program of licensees;
(v) collect, review, maintain, and publish energy statistics;
(vi) issue codes and standards of service and enforce these;
(vii) develop uniform methods of accounting for all licensees;
(viii) promote competition amongst licensees;
(ix) advise the government, if necessary, on energy matters;
(x) resolve disputes between licensees, and between licensees and consumers;
(xi) ensure appropriate remedies for consumer disputes, dishonest business practices, or abuses of monopoly positions;
(xii) ensure compliance of the energy sector with environmental standards; and
(xiii) perform any incidental functions considered appropriate by the BERC.

17. The Energy Regulatory Commission Act also sets out the tariff regulation duties of the BERC. Licensees submit tariff proposals in accordance with methodologies issued by the BERC. A determination is issued within 90 days of receipt of a proposal, following a public hearing in which the BERC sits as the judicial body, ruling on proposals from licensees and providing opportunity for public involvement. Tariffs can only be revised once in each fiscal year unless fuel prices change. The BERC’s regulations provide for tariffs to be set on an individual licensee basis following a cost-of-service methodology. Historically, the government has been unable to establish electricity tariffs on a cost-recovery basis. There is an in-built cross-subsidy across consumer classes, with domestic and irrigation consumers being subsidized by commercial and industrial consumers.

18. The BERC’s February 2011 order on electricity tariffs provided for an immediate 11.00% increase in the bulk supply tariff (BST) and a further 6.66% increase from August 2011, raising the BST to Tk2.80/kWh. From the increased BST revenues, 5.17% is to be allocated to an electricity maintenance and development fund, modeled on a similar development fund operational in the gas industry, the proceeds of which must be used for maintenance of power plants. The allowed increase is significantly lower than that requested by the BPDB, which was for an increase in the BST of 12% every 6 months during 2011–2013. The February 2011 tariff order also provided for an interim increase of 5% in retail electricity tariffs, although tariffs for residential consumption of up to 100 kWh per month, and for irrigation and religious and social customers, remain unchanged. In May 2012 the BERC announced that it will approve an uninterrupted power supply scheme for industry at Tk14.44/kWh, which is much higher than the average retail tariff of Tk5.55/kWh. This is a significant step towards cost-recovery in the energy sector.

19. In the early 1990s there was no private sector involvement in the energy sector. Since 1996, 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 and legislation include (i) the Private Sector Power Generation Policy of Bangladesh, adopted in 1996; (ii) Policy Guidelines for SPP [small power plants] in Private Sector, in 1998; (iii) Guidelines for RAPSS [remote area power supply systems], in July 2007; (iv) Policy Guidelines for Enhancement of Private Participation in the Power Sector, in 2008; (v) the Renewable Energy Policy of Bangladesh, adopted in January 2009; (vi) the BERC Act 2003; and (vii) unbundling of generation, transmission, and distribution functions into separate companies. More recently, the Ministry of Finance issued a policy paper for outli

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6 Section 22 of the BERC Act.
the power sector reforms. During 1996–2000, several major reforms were implemented: (i) the PGCB was established to gradually take over the operation of the high-voltage power transmission network (230 kV and 132 kV) from the BPDB (now complete); and (ii) DESCO was created to take over power distribution in the central Dhaka area from the Dhaka Electricity Supply Authority (DESA). Both the PGCB and DESCO were established on a commercial basis as government-owned companies under the Companies Act of 1994. Several privately owned power generation projects were also established during this period as IPPs selling electricity to the BPDB. Further institutional reforms were undertaken during 2001–2010 to improve governance and operational performance. The reforms included establishment of (i) the Western Zone Power Distribution Company in 2001 to take over power distribution from the BPDB, (ii) the DPDC in 2006 to take over the remaining operations of DESA, and (iii) the Electricity Generation Company of Bangladesh and the North-West Power Generation Company to implement several power generation plants financed by the Asian Development Bank and the World Bank.

20. Despite the satisfactory reforms in the 1990s and early 2000, energy sector reforms in Bangladesh have recently experienced setbacks. Further institutional reforms are needed in the sector, including conversion of the BPDB into a holding company, making generation companies independent, and making distribution companies fully functional to take over the BPDB’s distribution role. Such reforms have not been prioritized in the 2008-2011, while further liberalization of the industry under the reforms and further unbundling, together with tariff reforms, are required to ensure financially sustainable energy sector companies.

D. Future Outlook

21. As outlined, the energy sector’s main challenges are (i) providing universal access to power, (ii) providing good quality and reliable power supply, (iii) ensuring gas availability for generation, (iv) long-term energy security and fuel diversity, (v) cost-recovery and financial sustainability of energy sector agencies, and (vi) mainstreaming renewable energy. To address these challenges, significant investments in generation, transmission, and distribution are required. Achieving 68% access to electricity together with uninterrupted and good quality supply requires filling the funding gap of about $12.1 billion during 2012–2015. Undertaking these investments and further efforts on sector reforms are critical for meeting the sector challenges in the short run. Diversification of the fuel mix, as planned in the Energy Sector Master Plan, is also an important step towards long-term energy security in Bangladesh.

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7 Government of Bangladesh, Ministry of Finance, 2010, Towards Revamping Power and Energy Sector: A Road Map