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INVESTMENT BANK**

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**Approval Project Document  
of the Asian Infrastructure Investment Bank**

**People's Republic of Bangladesh  
Power System Upgrade and Expansion Project**

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## **CURRENCY EQUIVALENTS**

(As of Nov. 19, 2018, Bangladesh Bank)

Currency Unit = Bangladesh Taka (BDT)

USD1.00 = BDT 83.88

BDT1.00 = USD0.0119

## **ABBREVIATIONS**

AIIB	–	Asian Infrastructure Investment Bank
COD	–	commercial operation date
EIRR	–	economic internal rate of return
EPZ	–	export processing zone
ESIA	–	Environmental and Social Impact Assessment
ESMP	–	Environmental and Social Management Plan
ESP	–	Environmental and Social Policy
ESS	–	Environment and Social Standard
FIRR	–	financial internal rate of return
FY	–	fiscal year
GDP	–	gross domestic product
GIS	–	gas-insulated switchgear
GW	–	gigawatt
GWh	–	gigawatt-hour
IE	–	Implementation entity
km	–	kilometer
kV	–	kilovolt
kWh	–	kilowatt-hour
MW	–	megawatt
MVA	–	megavolt-ampere
O&M	–	operating and maintenance
PDS	–	project delivery strategy
PGCB	–	Power Grid Company of Bangladesh
PMU	–	project management unit
PPM	–	Project-affected People's Mechanism
RP	–	Resettlement Plan
RPF	–	Resettlement Planning Framework
WACC	–	Weighted Average Cost of Capital
WTP	–	Willingness to Pay

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## 1. Project Summary Sheet

### People's Republic of Bangladesh Power System Upgrade and Expansion Project (the Project)

Project No.	000088
Client/ Borrower(s) Implementation Entity	People's Republic of Bangladesh Power Grid Company of Bangladesh Ltd. (PGCB)
Sector(s) Subsector(s)	Energy Power transmission
Project Objectives/Brief Project Description	The objective of the Project is to upgrade and strengthen power transmission systems in the Chittagong area to ensure adequate and reliable power supply. The Project is to finance the construction of 46 kilometers (km) of double-circuit transmission lines, associated substations and line bays.
Project Implementation Period (Start Date and End Date)	April 1, 2019-Dec. 31, 2022
Expected Loan Closing Date	June 30, 2023
Project cost and Financing Plan	Total Project Cost: USD176.60 million Financing Plan: <ul style="list-style-type: none"> <li>- AIIB loan: USD120.00 million</li> <li>- Government: USD46.39 million</li> <li>- PGCB: USD10.21 million</li> </ul>
AIIB Loan (Size and Terms)	USD120 million, with a tenor of 20 years including a grace period of five years.
Co-financing (if any)	None
Environmental and Social Category	Category B
Project Risk (Low/Medium/High)	Medium
Conditions for Effectiveness and Disbursement (if any)	The additional condition for effectiveness is that PGCB's Subsidiary Loan Agreement with the Borrower has been executed and are binding on the parties.
Key Covenants	The Borrower shall ensure that the implementation of all Project activities complies with AIIB's Environmental and Social Policy and Standards, AIIB's Policy on Prohibited Practices and AIIB's Procurement Policy and its associated Interim Operational Directive on Procurement Instructions for Recipients.
Policy Assurance	The Vice President, Policy and Strategy confirms an overall assurance that the Bank is in compliance with the policies applicable to the Project.

<b>President</b>	Jin Liqun
<b>Vice President</b>	D. J. Pandian
<b>Director General, IO II</b>	Yee Ean Pang
<b>Manager, IO II</b>	Rajat Misra
<b>Project Team Leader</b>	Hongliang Yang, Senior Investment Operations Specialist
<b>Project Team Members</b>	Bin Wang, Senior Policy and Strategy Officer Haiyan Wang, Senior Finance Officer Julius Thaler, Senior Counsel Ning Wu, Financial Management Consultant Pajnapa Peamsilpakulchorn, Economist Somnath Basu, Senior Social Development Specialist Yan Li, Economic and Financial Consultant Yunlong Liu, Procurement Specialist Zhixi Zhu, Environmental Specialist Baihui Sun, Project Assistant

## 2. Strategic Context

### A. Country Context

1. Being a developing country with a population of around 160 million, Bangladesh has maintained an impressive growth rate of more than six percent annually in the last decade. In 2017, its gross domestic product (GDP) per capita reached USD1,480.<sup>1</sup> Its export-led growth has been supported by an abundance of low-cost labor, including an increase in female labor population, and productivity gains from shifting away from agriculture to manufacturing. Real GDP growth in fiscal year (FY) 2017 accelerated to 7.3 percent from 7.1 percent in FY2016, led by strong private consumption and investment. Headline inflation picked up slightly towards end of fiscal year with higher food prices caused by flood-related disruption in agricultural harvest. Looking ahead, Bangladesh's GDP growth is projected at around seven percent, driven by strong domestic demand. In the near-term, the main downside risks include the impact from global trade downturn, the Rohingya refugee crisis and a resumption of political unrest in the run up to the elections in December 2018. Bangladesh's risks of external debt distress and overall debt distress continue to be assessed as low. The external debt to GDP ratio is projected to remain stable around 18 percent in the medium term.<sup>2</sup>

2. Bangladesh still faces daunting development challenges. In 2017 about 13.8 percent of its population was below the international poverty line of USD1.90 per day, compared to 44.2 percent in 1991. In 2018, Bangladesh met all three eligibility criteria for graduation from the list of the United Nation's Least Developed Countries for the first time. If the country can sustain its economic performance, it will be considered for graduation from the list at the next triennial review in 2021.<sup>3</sup> Sustained economic growth has rapidly increased the demand for infrastructure such as energy, transport, and water supply and sanitation. Despite its recent achievements, the Government of Bangladesh still needs substantial efforts on many fronts, such as maintaining macroeconomic stability, improving economic governance and urban management, adapting to climate change and addressing persistent infrastructure deficits.

3. Rapid urbanization in Bangladesh adds considerable pressures on its capacity-constrained infrastructure. Like many other developing countries, Bangladesh is experiencing rapid urbanization. If the current rate of urbanization continues, the urban population in Bangladesh will double before 2040. Industrialization and urbanization are to a large extent a single symbiotic process in the country. The successful management of this process requires secure and reliable power supply. To date, power supply in Bangladesh has not been able to keep pace with the rapid growth in power demand. The government has identified power supply shortage as a key constraint to the country's economic growth and has set a target to provide electricity for all by 2021, when the country celebrates its 50<sup>th</sup> year of independence. In line with

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<sup>1</sup> World Bank Group (WBG), 2017. Country Snapshot for Bangladesh (October 2017).

<sup>2</sup> International Monetary Fund (IMF), 2018 Country Report No.18/158 2018 Article IV consultation – Press release; staff report; and statement by the executive director for Bangladesh, Jun. 2018.

<sup>3</sup> United Nations, 2018. Committee for Development Policy: Report on the twentieth session (March 12–16, 2018), New York.

the government's development plan,<sup>4</sup> sizeable investments in the power sector have been prioritized to deliver the needed electricity to sustain the economic growth of the urban and rural sectors in Bangladesh.

## **B. Sectoral and Institutional Context**

4. Poor and unreliable power supply impedes Bangladesh's economic performance, reduces its business competitiveness and productivity and seriously affects the quality of life of Bangladeshis. As of May 28, 2018, about 90 percent of the people in Bangladesh had access to power, and annual power consumption per capita in 2017 increased to 375 kilowatt-hour (kWh).<sup>5</sup> These figures show a continuous substantive improvement from 47 percent and 220 kWh in 2009 and 65 percent and 321 kWh in 2015, respectively.<sup>6</sup> However, compared with the world average per capita annual power consumption of about 3,125 kWh in 2014, Bangladesh's power sector clearly has a long way to go.

5. Aside from power generation shortfall, due to lack of investments and insufficient maintenance, the reliability of the network deteriorated over time, resulting in frequent system collapses. Most manufacturing and service firms in Bangladesh identified the shortage of reliable power supply as the biggest constraint to their operations. In 2017, out of 137 countries, Bangladesh was ranked 111<sup>th</sup> on overall infrastructure and 101<sup>st</sup> on the quality of power supply.<sup>7</sup> It was estimated that poor power supply has shaved off Bangladesh's GDP by two-three percent annually, of which a significant amount was spent on diesel generators for backup.<sup>8</sup>

6. The Government of Bangladesh has taken various programs to meet the growing demand for power in the country, including: (i) improving the efficiency of existing power plants; (ii) developing new generation capacity based on renewables and fossil fuels; (iii) adopting off-grid electrification programs, such as solar home systems<sup>9</sup> and (iv) constructing cross-border transmission lines to import power from neighboring countries, such as India and Nepal. Given these efforts, more people have been connected to the grid today. The government has planned to increase the installed generation capacity to 24 gigawatt (GW) by 2021 and reach 60 GW by 2041, of which 55 percent will be owned by public sector entities and 45 percent by independent power producers and rental units (e.g., normally smaller in scale and mainly running on liquid fuel).<sup>10</sup>

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<sup>4</sup> Planning Commission of the Government of Bangladesh, 2015. *Seventh Five-Year Plan (FY2016-2020): Accelerating Growth, Empowering Citizens*. Dhaka, Bangladesh.

<sup>5</sup> Power Cell, Government of Bangladesh, 2018. *Power Sector at a Glance*. Dhaka, Bangladesh.

<sup>6</sup> Planning Commission, Government of Bangladesh, 2015. *Seventh Five Year Plan (2016-2020)*. Dhaka, Bangladesh.

<sup>7</sup> World Economic Forum, 2017. *The Global Competitiveness Report 2017-2018*.

<sup>8</sup> World Bank, 2018. *Enhancement and Strengthening of Power Transmission Network in Eastern Region Project*.

<sup>9</sup> Bangladesh currently has more than 5 million solar home systems installed, the largest number globally.

<sup>10</sup> Power Division, Government of Bangladesh, 2016. *Power System Master Plan (2016)*. Supported by Japan International Cooperation Agency.

7. However, for years development of the transmission and distribution network has not kept pace with the growth of generation capacity and demand. The country currently has 10,538 circuit-km of transmission lines and about 27,273 megavolt-ampere (MVA) transformer capacity at different voltage levels (Table 1).<sup>11</sup> Due to the rapid growth of power demand, a considerable portion of transmission lines and substations are overloaded. This causes frequent collapses of major equipment and network failures, leading to deteriorating system reliability. Although some improvements were made in recent years, the transmission and distribution system losses in Bangladesh remained high at around 13 percent in 2018 according to official statistics.<sup>12</sup> Compared to the system losses in China at only 6.4 percent in 2017,<sup>13</sup> there is significant scope to improve the system efficiency. This further undermines the financial health of power sector entities and their capacity to raise the needed investments. Interventions are therefore needed to break up the vicious circle. This is particularly urgent for the key economic growth centers, such as Dhaka and Chittagong.

**Table 1: Transmission Lines and Substations at Different Voltage**

Transmission Lines		Substations	
Voltage (kV)	Circuit (km)	Voltage (kV)	Number (MVA)
400	560	400 (direct current)	1 (500 megawatt (MW))
230	3325	400/230	2 (1,560)
132	6750	400/132	1 (650)
		230/132	19 (9,675)
		132/33	91 (14,888)
<b>Total</b>	<b>10,538</b>		<b>27,273</b>

8. Located in southeastern part of Bangladesh, Chittagong is the second largest city in the country with a population of 2.84 million in the city center, and over 4.0 million in the metropolitan areas.<sup>14</sup> Chittagong contributes to about 40 percent of the country's industrial output, 80 percent of its international trade and 50 percent of its governmental revenue. The region boasts vibrant residential, commercial and industrial sectors with robust and rapidly growing demand for electricity. Important economic establishments, such as the Chittagong Sea Port, Chittagong Eastern Refinery, Chittagong Export Processing Zone (EPZ), Karnaphuli EPZ, and Korean EPZ are operating in or around the city, and more similar economic and commercial establishments have been planned and will come out soon.

9. The Power Division under the Ministry of Power, Energy and Mineral Resources is the apex governmental office responsible for overall power sector operations in Bangladesh. Established in 1996, the Power Grid Company of Bangladesh (PGCB) is currently the entity responsible for operating and developing power transmission networks in the country. PGCB has undertaken several projects to

<sup>11</sup> Power Grid Company of Bangladesh (PGCB), 2018. PGCB at A Glance.

<sup>12</sup> Power Grid Company of Bangladesh, 2018. PGCB at A Glance.

<sup>13</sup> China Electric Council, 2018. National Power Industry Statistics Bulletin 2017. Beijing.

<sup>14</sup> Bangladesh Population Census 2011, Bangladesh Bureau of Statistics.



build more than 3,000 km of new transmission lines and 106 new substations by 2020 and plans to add 3,000 km of transmission lines and 90 substations by 2025. To improve the system performance, many of these transmission lines and substations will be constructed at higher voltage levels. The proposed Project is in line with PGCB's development plan and will construct 46 km of 400 kV double-circuit transmission lines and associated substations/line bays in the Chittagong region. Upon Project completion, a better extended and more strengthened transmission network will make private sector participation in power generation much easier.

### 3. The Project

#### A. Rationale

10. **Strategic Fit.** The Project is to finance the construction of 46 km of double-circuit transmission lines, associated substations and line bays. It will promote energy access and security and support in-country connectivity and is aligned with AIIB's mandate and its Energy Sector Strategy. Power shortage, exacerbated by aging, overloaded and unreliable transmission systems, is a major development constraint in Bangladesh. The Project will strengthen the transmission system in the Chittagong region, helping to meet the rising need for reliable power supply and promoting economic growth in the country's second largest economic center.

11. **Government Priority.** The Project is highly relevant to the development priorities of Bangladesh, which is targeting electricity for all by 2021 in its development plans and policies. Ensuring an adequate power supply will help move the country into middle-income status. An enhanced and well-connected transmission network will provide a higher level of supply security in the region. The Project will also help reduce the high system losses in Bangladesh (currently around 13 percent)<sup>15</sup> by upgrading the transmission voltage. The electricity thus saved provides additional benefits.

12. **Value-added by the Bank.** AIIB's involvement will add substantial value in project preparation and implementation. AIIB's long-term financing support will help the client reduce the Project's financing uncertainty and move the Project forward quickly. AIIB's participation will also help the implementation entity (IE) strengthen its institutional capacity and improve project quality through application of international standards and good practices.

13. **Value addition to the Bank.** Through the Project, AIIB will continue to strengthen its institutional capacity and knowledge in power transmission. The Project will also increase AIIB's presence in the power sector in Bangladesh, where it is already participating in two other projects, in power distribution and generation. This will enhance the quality and strength of its sector cooperation with the government.

#### B. Objective

14. The objective of the Project is to upgrade and expand the power transmission system in the Chittagong region to ensure adequate and reliable power supply.

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<sup>15</sup> Power Grid Company of Bangladesh, 2018. PGCB at a Glance.

15. The Project's outputs can be measured using the following key indicators:
- Length of 400 kV transmission lines constructed (unit: km).
  - Length of 230 kV transmission lines constructed (unit: km).
  - Number of gas-insulated switchgear (GIS) substations constructed (unit: number).
  - Number of new line bays constructed (unit: number).
16. The Project's outcomes can be measured using the following key indicators:
- Capacity of power transmission added in the Chittagong region (unit: MVA).
  - Additional electricity transmitted annually (unit: gigawatt-hour (GWh)).
  - Load shedding reduced in the Chittagong region (unit: percentage).
17. Upon Project completion, the capacity of the 400 kV and 230 kV transmission networks in the Chittagong region will be enhanced. This will create cascading benefits to the 132 kV and 33 kV secondary networks with respect to the quality of power supply in the region, such as improved voltage stability and reduced voltage fluctuation. It is expected that load shedding will be reduced, and new consumers will be connected to the grid in the region.

### **C. Project Description and Components**

18. Transmission lines, associated substations and line bays will be constructed in the Chittagong region. This will collectively provide 1,400 MVA transmission capacity at different voltage levels.
19. The proposed Project includes the construction of the following facilities, covering:
- (i) 400 kV transmission lines: about 27 km
    - Anowara-Anandabazar (New Mooring) 400 kV double-circuit transmission line: 20 km overhead line and 7 km underground cable.
  - (ii) 230 kV transmission lines: about 19 km
    - Hathazari-Rampur 230 kV double-circuit underground cable: line-in and line-out at Anandabazar (New Mooring), 3 km.
    - Madunaghat–Khulshi 230 kV double-circuit underground cable: 16 km.
  - (iii) 230 kV GIS substations: 2
    - 230/132 kV GIS substation at Anandabazar (New Mooring) with transformer of 2×350/450 MVA.
    - 230/132/33 kV GIS substation at Khulshi with transformer of 2×350/450 MVA (230/132kV) and 3×80/120MVA (132/33kV).
  - (iv) Bay extensions: 2
    - Two 230 kV GIS line bays at Madunaghat substation.

## D. Cost and Financing

20. The Project's preliminary cost estimate is about USD176.60 million.<sup>16</sup> Table 2 shows the Project's cost estimate and financing plan.

**Table 2: Cost Estimates and Financing Plan (USD million)**

Item	Total Cost	Government		PGCB		AIB	
		Amount	%	Amount	%	Amount	%
<b>A. Base Cost</b>							
1 Capital costs (e.g., equipment, construction, etc.)	114.93	0	0	0	0	114.93	100
2 Local expenditures (e.g., staff salary, admin. costs, etc.)	2.81	0.29	10	2.52	90	0	0
3 Taxes and Duties	44.32	44.32	100	0	0	0	0
<b>B. Contingencies</b>							
1 Physical Contingency	3.39	0.89	26	0.20	6	2.30	68
2 Price Contingency	3.56	0.89	25	0.20	6	2.47	69
<b>C. Financing Charges during Construction</b>	7.59	0	0	7.29	96	0.30*	4
<b>Total Project Cost (A+B+C)</b>	176.60	46.39	26	10.21	6	120.00	68

Note: \* This only includes front-end fee, excluding commitment fee and interest of AIB's loan.

21. The government has requested a loan of USD120 million to help finance the Project. The loan is proposed to have a 20-year term, including a grace period of five years, at AIB's standard interest rate for sovereign-backed loans with the corresponding weighted average maturity. The balance of the Project cost will be covered by the Government of Bangladesh and/or PGCB.

## E. Implementation Arrangement

22. The planned implementation arrangements are summarized in Table 3.

**Table 3: Implementation Arrangements**

Aspects	Arrangements
Project implementation period	April 1, 2019 – Dec. 31, 2022
Loan closing date	June 30, 2023
Management	
(i) Oversight body	Steering Committee, Power Division
(ii) Implementation entity (IE)	PGCB
(iii) Project Management Unit (PMU)	PMU established with qualified staff after loan approval
Procurement: goods and works	All works and goods to be financed will be procured in accordance with AIB's Procurement Policy and guidelines.
Retroactive financing and advance contracting	Retroactive financing is available for eligible expenditures paid one year before the date of signing of the Loan Agreement. Advance contracting is provided for preparing tender documents and inviting and receiving tenders for

<sup>16</sup> Foreign exchange rate: USD1.00 = BTD83.75.

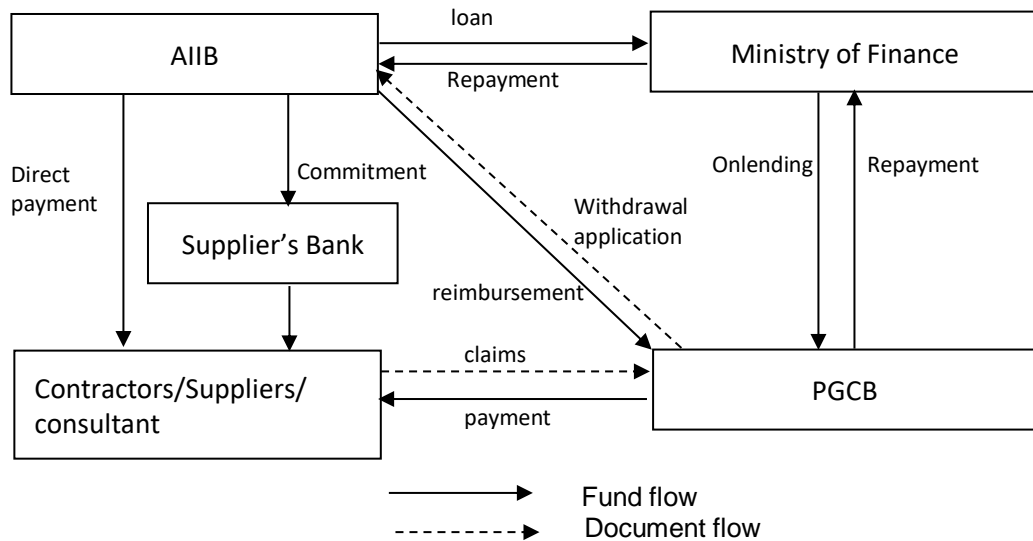
Aspects	Arrangements
	contracts.
Disbursement	The loan proceeds will be disbursed in accordance with the AIIB's loan disbursement instructions and detailed arrangements agreed upon between the Government of Bangladesh and AIIB.

23. PGCB will set up a PMU to lead the Project implementation after loan approval. The PMU will be headed by senior engineers and staffed by adequate personnel and will be responsible for (i) overall project management and monitoring, (ii) annual budget preparation and monitoring of utilization of loan proceeds, (iii) progress reporting, including reports on cost management and project outputs, and (iv) compliance with loan covenants. The Power Division will designate a senior officer to oversee the project implementation and settlement of implementation issues.<sup>17</sup>

24. **Procurement.** AIIB's Procurement Policy (dated January 2016) and Section II of its associated Interim Operational Directive on Procurement Instructions for Recipients (dated June 2, 2016) shall apply to the procurement of all contracts funded in whole or in part by AIIB under the Project. PGCB is responsible for implementing the Project, including all aspects of the procurement process from the planning, design, and tendering stages through to contract award and supervision of contract implementation. A Project Delivery Strategy including a detailed procurement plan is in Annex 4.

25. **Fund Flow Arrangement and Disbursement.** The Government of Bangladesh will onlend the proceeds of the loan to PGCB through a Subsidiary Loan Agreement (Figure 1). The government and PGCB will ensure that all expenditures financed out of the loan proceeds are used exclusively in carrying out the Project and will exercise its rights in such manner as to protect its interests and those of AIIB and to accomplish the purposes of the loan.

**Figure 1: Fund Flow Diagram**



<sup>17</sup> For details, please refer to the annex: project implementation arrangement.

26. The loan proceeds will be disbursed in accordance with AIB's loan disbursement instructions. Multiple disbursement methods will be provided to accommodate the needs of the Project, such as direct payment, advance payment, reimbursement (contract-based) and special commitment method. Before the submission of the first withdrawal application, the Government of Bangladesh should submit to AIB sufficient evidence of the authority of the person(s) who will sign the withdrawal applications on behalf of the government, together with the authenticated specimen signatures of each authorized person.

27. **Monitoring and Reporting.** PGCB will be responsible for monitoring the Project progress through its project monitoring system, and the PMU will do the daily work. PGCB will submit to AIB consolidated quarterly reports and annual reports on project implementation progress. The contents of the reports will cover all essential aspects of project implementation, including contract awards, disbursements, physical progress as per the defined key performance indicators, compliance of environmental and social safeguard requirements, key implementation issues and solutions, and updated implementation and procurement plans for next 12 months. PGCB will also submit a project completion report within six months of physical completion of the Project.

28. Project implementation will be monitored by AIB's project administration missions on a regular basis, including project inception mission, review mission, and midterm review mission, if necessary. In case of any compliance discrepancy identified during project implementation, a corrective plan will be developed and implemented to resume compliance. To ensure the Project to be continuously viable and sustainable, project accounts and PGCB's audited financial statements, together with the associated auditor's report, would be adequately reviewed. PGCB is required to keep detailed records on project implementation for future verification.

#### **4. Project Assessment**

##### **A. Technical**

29. The Project presents no significant technical risk. Technical due diligence was conducted based on (i) project proposal and feasibility study, (ii) studies on load demand and consumer growth of the southern region, (iii) discussions with the planning and designing engineers, and (iv) project site visits conducted in September and November 2018. PGCB has a proven track record in financing and implementing large and difficult transmission projects, including those financed by development partners.

30. The Project is technically sound as demonstrated by the following major aspects: (i) the activities supported under the Project are well-established in Bangladesh and other countries; (ii) PGCB has developed in-house technical capabilities for planning, designing and operation and maintenance of the transmission system; and (iii) the technical and operational standards selected, such as voltage level and technical specifications of equipment, are in line with global practices.

## B. Economic and Financial

31. **Economic Analysis.** A cost-benefit analysis was carried out to assess the economic viability of the Project on a with- and without-project basis. Without the Project, it is assumed that unserved demand of the existing and new consumers will be met by self-generated power (e.g. diesel generators) at higher cost than grid supplied electricity. With the Project, additional power at cheaper cost will be made available to serve existing and new consumers in the Chittagong area. The Project is assumed to operate 33 years after completion. Costs and benefits are estimated in constant 2018 prices. A social discount rate at 12 percent is applied as per the recommendation of the Planning Commission of the Government of Bangladesh.

32. The Project investments are expected to increase the network capacity to serve incremental load flow of 1,400 MW. The incremental load is projected to increase from 499 MW in 2023 to 1,392 MW in 2037 and thereafter, representing an average growth rate of eight percent. With average system load factor at 66.65 percent,<sup>18</sup> and after factoring in transmission and distribution losses, an estimated additional 2,573 GWh will be available to serve end users annually in 2023, growing to 7,179 GWh in 2037 and throughout the Project life.<sup>19</sup>

33. The economic benefits are estimated using Willingness to Pay (WTP) for the additional power supply made possible by project investment. The WTP is valued at USD0.198 per kWh, the weighted average WTP for two main consumption groups in Chittagong, industry and commercial consumers and residential consumers. The Project's economic costs include capital investments in transmission system to be supported by the Project and the associated investments in distribution system needed to serve end users. Recurrent costs include operation and maintenance (O&M) costs of the transmission and distribution systems as well as cost of power supply. The cost of power supply is estimated based on weighted average of heavy fuel oil (HFO)-fired and combined cycle gas turbine power plants plus transmission and distribution costs.

34. Based on available data and assumptions adopted, in the base case scenario, the economic internal rate of return (EIRR) for the proposed Project is 56.6 percent and its net present value at social discount rate of 12 percent is USD1,408 million. The EIRR exceeds the hurdle rate and the Project is considered economically viable. Given the uncertainties associated with various market and project-specific parameters, sensitivity study is carried out to assess the robustness of the economic viability of the Project investment. The economic viability of the Project investment is highly robust to withstand large variations in four scenarios of (i) 20 percent construction cost overruns; (ii) two years delay in commercial operation date (COD); (iii) 20 percent increase in cost of supply; and (iv) worst case scenario which is a combination of all the above. In addition, a sensitivity analysis was conducted using a more conservative estimate of WTP based on the weighted average of current tariff of USD0.159 per kWh,

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<sup>18</sup> Bangladesh Power Development Board Annual Report (FY2016-017).

<sup>19</sup> According to load forecast for New Mooring and Khulshi substations in the Power System Master Plan 2021.

which also yields the EIRR above the hurdle rate of 12 percent. The results of the analysis are provided in more details in Annex 3.

35. **Financial Analysis.** The financial analysis was carried out from the perspective of PGCB. Project costs include both investment costs and O&M costs of the transmission system only. Project benefit is measured in terms of revenue from incremental wheeling charge which stands at USD 0.003 (BDT 0.2791) per kWh. Tariff are assumed to increase at four percent per annum on average based on historical adjustment and expected increase in the future. The financial costs included taxes, duties, contingencies and financing costs.

36. Based on the above assumptions, in the base case scenario with the Weighted Average Cost of Capital (WACC) at 6.8 percent, the Project investment yield a financial net present value of USD222 million, and a financial internal rate of return (FIRR) of 11.9 percent, exceeding the WACC. Therefore, the Project investment is financially viable. Sensitivity study was carried out to assess the robustness of the financial viability of the Project. The Project investment is highly robust to withstand large variations in key market and project-specific parameters in three scenarios: (i) 20 percent construction cost overruns; (ii) two years delay in COD; and (iii) a combination of both factors. However, the FIRR is less robust to the scenario with no or tardy tariff adjustment. The results of the analysis are provided in more details in Annex 3.

37. **Financial Assessment of PGCB.** Over the period FY2013-2017, PGCB's revenues from wheeling charge increased at a cumulative annual average growth rate of 16.6 percent. The growth in net income over the same period is faster albeit at an unsteady pace, resulting in widely varied profit margin. This is mainly due to delayed and insufficient increases in transmission tariff in 2014. The current tariff methodology allows PGCB to earn return on assets covering interest, taxes and O&M costs. To keep its tariff cost-reflective, PGCB must regularly submit tariff applications to the Bangladesh Energy Regulatory Commission to adjust the tariff. PGCB's financial figures are provided in Annex 3.

### **C. Fiduciary and Governance**

38. **Procurement.** PGCB is implementing projects of similar size and nature which are separately financed by the World Bank and the Asian Development Bank. Its procurement staff is familiar with the procurement policies of both of those banks, including procurement methods, processes and procedures, standard bidding documents, etc. The preliminary assessment is that PGCB has sufficient capacity to carry out the procurement of works, goods, and consulting services under the proposed Project in accordance with AIIB's Procurement policies and procedures. Procurement arrangements have been spelled out in the Project Delivery Strategy and procurement plan, which will be updated on an as-needed basis for AIIB review and no objection during project implementation.

39. **Financial Management.** PGCB has experience working with international development partners, as noted in previous paragraph. PGCB's financial management capacity is satisfactory, because: (1) majority of financial staff, particularly

accountants, have master's degree in accounting or financing and have more than five years professional working experience. Some financial staff will be dispatched from PGCB Finance Department to the PMU in charge of project financial management after loan approval; (2) PGCB will set up a dedicated bank account for the loan and the PMU will have its own accounting and reporting systems; (3) accounting and reporting standards used are in line with the international standards; (4) before project payment is made, all related expenditures will be reviewed by technical and financial staff and signed off by officials with authorization, including project director, financial manager, and managing director of PGCB; and (5) PGCB has established procedures for internal and external audit. The Project will be audited by the Foreign Aided Projects Audit Directorate of the Office of Comptroller and Auditor General of Bangladesh. The Government of Bangladesh and PGCB will ensure that proper accounts and records of use of loan proceeds are maintained and audited in a timely manner. During the Project implementation, AIIB team will provide necessary support to strengthen PGCB's financial management capacity if needed.

40. **Anti-corruption.** AIIB's Policy on Prohibited Practices (2016) has been provided to PGCB and will be included in the legal agreements. Implementation will be monitored rigorously and regularly by the Bank. AIIB reserves the right to investigate—directly or indirectly through its agents—any alleged corrupt, fraudulent, collusive or coercive practices relating to the Project and to take necessary measures to prevent and redress any issues in a timely manner, as appropriate.

#### **D. Environmental and Social**

41. **Environmental and Social Categorization.** The Project has been prepared consistent with AIIB's Environmental and Social Policy (ESP) and Environmental and Social Standards (ESS). The Project has been assigned Category B. ESS 1, Environmental and Social Assessment and Management and ESS2, Involuntary Resettlement apply to the Project.

42. **Environmental and Social Instruments: ESIA.** As required for a Category B Project, an Environmental and Social Impact Assessment (ESIA) has been prepared by PGCB to identify the environmental and social risks and impacts of the Project. The ESIA includes an Environmental and Social Management Plan (ESMP), which delineates the mitigation and monitoring measures for the identified risks and impacts. The ESMP includes a reporting mechanism among responsible agencies and a monitoring plan during construction and post-construction phases. The budget for implementing the ESMP has been developed.

43. **Environmental and Social Instruments: RPF.** ESS 2, Involuntary Resettlement also applies because of the anticipated need to address and compensate for: (a) the limited temporary disruption to livelihoods of shopkeepers along the alignment of the underground cables; and (b) limited crop loss as a result of construction of overhead cables on agricultural lands. A Resettlement Planning Framework (RPF), consistent with ESS 2 has been prepared on the basis of the initial Project area design to address these issues. Anticipated costs to address and



compensate for these issues are covered in the ESIA. Once the final Project design is prepared, a resettlement plan (RP) will be prepared in accordance with the RFP.

44. **Key Environmental and Social Issues.** The Project is expected to generate socio-economic benefits by ensuring adequate and reliable power supply and promoting economic development in the region. The Project is not located in ecologically critical areas, and the potential negative impacts of the Project will be temporary and reversible in nature and will occur mostly during the construction phase.

45. The Project's adverse environmental and social impacts will primarily comprise temporary disruptions in traffic and public utilities, air pollution, noise, and impacts on vegetation, crops and top soil particularly in agricultural lands, all of which will be addressed through mitigation measures included in the ESIA. As noted above, temporary disruption of livelihoods of shopkeepers along the alignment of the underground transmission line, and loss of agricultural crops due to construction of overhead cables, are anticipated. The RPF provides guidelines for addressing and compensating these losses, which will be reflected in a RP. The ESIA includes an initial estimate of the number of affected shopkeepers and agricultural households and estimated costs associated with compensating for such losses.

46. Although no visible cultural resources have been identified, since there will be some underground work, in the event of any chance finds of cultural significance, PGCB will make use of chance find procedures outlined in the ESIA. Labor issues are identified in the ESIA, including child and forced labor due to low wages, conflicts between local and external laborers, spread of contagious disease from external laborers. Mitigating measures include strict prohibition in tender documents on hiring children, preferential hiring of local laborers (especially Project-affected people), measures to address worker health issues, and measures to create a safe working environment for women. Gender issues are also addressed elsewhere in the ESIA, through, for example, including a female member of the local government institution (Union Parishad) on the Project-level Grievance Redress Committee (see Project-level Grievance Redress Mechanism below) and disaggregating data on women in the social analysis. The ESIA also addresses impacts during post-construction phase, which include the impacts of noise and waste disposal from maintenance and substations.

47. In summary, the environmental and social risks have been identified and appropriate mitigation and monitoring measures are included in the ESIA and RPF for the construction and post-construction phases. Provisions related to compensation for loss of livelihood, occupational health and safety, labor conditions and traffic management are also presented in these instruments.

48. **Public Consultation and Information Disclosure.** Consultations were held in phases during the preparation of the ESIA. The ESIA was finalized based on comments and feedback received from the participants/affected people during the consultations. The ESIA and the Bengali translation of the Executive Summary and

the RPF are disclosed at the website of PGCB<sup>20</sup> and in printed form in the project area. Continued consultations are planned with project-affected people before and after construction begins. The documents will be updated as needed to incorporate the feedback and comments from the consultations.

49. **Project-level Grievance Redress Mechanism.** PGCB will establish a Project-level Grievance Redress Mechanism (GRM) in accordance with the requirements of AIIB's ESP for the Project, which will be operational soon after effectiveness. The GRM will include a procedure to receive and facilitate resolution of Project-affected peoples' concerns, complaints and grievances about any irregularities in application of the ESIA and RPF. The GRM would not preempt legal access to the courts or the PPM (see below) for resolution of grievances. The GRM will operate at three levels: (a) PMU field officers will receive and respond to grievances from Project-affected people, and seek to resolve minor grievances; (b) if the grievance cannot be resolved at the field level, it will be referred to a PMU Grievance Committee; and (c) if the matter cannot be resolved at the PMU Grievance Committee level, the matter will be referred to a Grievance Redress Committee. The GRM process is outlined in more detail in the RPF.

50. **Project-affected People's Mechanism.** The Project-affected People's Mechanism (PPM) has been established by AIIB to provide an opportunity for an independent and impartial review of submissions from Project-affected people who believe they have been or are likely to be adversely affected by AIIB's failure to implement its ESP in situations when their concerns cannot be addressed satisfactorily through Project-level Grievance Redress Mechanism or AIIB Management's processes.<sup>21</sup>

## **E. Risks and Mitigation Measures**

51. The Project's Risk Rating is "medium", as no major uncontrollable technical or environmental risks have been identified so far. Further detail is provided in Table 4.

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<sup>20</sup> For more details, please refer to the website: <https://pgcb.org.bd/PGCB/?a=pages/esia.php>

<sup>21</sup> For information on the PPM, including how to make submissions, please visit <https://www.aiib.org/en/policies-strategies/operational-policies/policy-on-the-project-affected-mechanism.html>

**Table 4: Risk Assessment and Risk Management Plan**

<b>Risk Description</b>	<b>Assessment</b>	<b>Risk Management Plan / Mitigating Measures</b>
Price increase in goods and materials leading to cost overrun	Medium	Costs of major items benchmarked to similar ongoing projects in the country, and provision of sufficient amount for contingencies. The Government of Bangladesh and PGCB have confirmed that any financing shortfalls will be covered.
Inadequate implementation of ESMP and RPF	Medium	Environmental and social instruments will be included in the tendering documents and terms of references for supervision consultants and contractors. Independent monitoring will be conducted periodically to ensure effective implementation of ESMP and RPF.
Procurement failure or delay, improper tendering procedures and/or inadequate record keeping	Medium	Use of large value procurement packages to attract large international/domestic specialized contractors to participate in the tendering, to strengthen, facilitate and enhance due diligence and control; agreed systems put in place for procurement record keeping and documentation preservation for audit and post-review.
Insufficient transmission tariff	Medium	Tariff regulations issued by BERC in June 2016 allow PGCB to file periodically for tariff adjustment to cover costs. Importantly, AIIB loan is covered by a sovereign guarantee.
Misuse of loan proceeds	Low	Agreed systems and procedures put in place within PGCB to ensure that proper accounts and records will be maintained and audited in a timely manner to adequately identify the use of loan proceeds; independent expert to be recruited by AIIB to verify the implementation results.
<b>Overall Rating</b>	<b>Medium</b>	

### Annex 1: Results Framework and Monitoring

Project Outcome Indicators	Unit	Baseline 2018	Target Values				Data Collection and Reporting		
			2019	2020	2021	2022	Frequency	Data Collection Instruments	Responsibility for Data Collection
Capacity of power transmission added	MVA	0	0	0	0	1,400	Annually	Project implementation report	PGCB
Additional electricity transmitted annually	GWh	0	0	0	0	2,500	Annually	Project implementation report	PGCB
Daily load shedding in Chittagong	%	11.5*	0	0	0	6.0	Annually	Project implementation report	PGCB
<b>Project Output Indicators</b>									
400 kV transmission lines constructed	km	0	0	0	15	27	Quarterly	Project implementation report	PGCB
230 kV transmission lines constructed	km	0	0	0	12	19	Quarterly	Project implementation report	PGCB
230 kV GIS substations constructed	No.	0	0	0	1	2	Quarterly	Project implementation report	PGCB
230 kV line bays constructed at Madunaghat substation	No.	0	0	0	1	2	Quarterly	Project implementation report	PGCB

\*: Bangladesh Power Development Board, 2018.

## Annex 2: Sovereign Credit Fact Sheet

### A. Recent Economic Development

1. Bangladesh is a lower-middle-income country with per capita income of US\$1480 in 2017. Its export-led growth over the last two decades has been supported by an abundance of low-cost labor, an increase in female labor force participation, and productivity gains from a shift away from agriculture to manufacturing. It registered robust growth averaging 6.5 percent per annum during 2011-2016. Real GDP growth in FY2017 accelerated to 7.3 percent from 7.1 percent in FY2016, led by strong private consumption and investment. Headline inflation picked up slightly towards end of fiscal year with higher food prices caused by flood-related disruption in agricultural harvest. The current account balance turned into deficit due to slower export growth, higher imports, and decline in remittances.

### B. Selected Macroeconomic Economic Indicators

Economic Indicators	FY2015	FY2016	FY2017	FY2018*	FY2019*	FY2020*
National income and prices (change %)						
Real GDP growth	6.6	7.1	7.3	7.3	7.1	7.0
CPI inflation (change % average)	6.4	5.9	5.6	6.0	6.1	6.1
Central government operations (% of GDP)						
Overall balance (including grants)	-4.0	-3.4	-3.3	-4.2	-4.6	-4.3
External debt (% of GDP)	19.1	18.5	18.5	17.5	17.2	17.2
Gross external financing need (billion USD)	-0.3	3.4	9.2	17.9	17.8	16.7
Public debt (% of GDP)	33.7	33.3	33.2	34.0	35.2	36.1
Gross public financing need (% of GDP)	7.8	6.5	9.2	9.8	8.5	7.2
Money and credit						
Broad money (M2, % annual change)	12.4	16.3	10.9	12.9	--	--
Foreign direct investment inflow (% of GDP)	0.9	0.6	0.7	0.7	0.8	0.7
Gross reserves (months of imports)	6.5	7.2	7.0	6.4	5.7	5.2
Current account balance (% of GDP)	1.8	0.6	-2.0	-3.2	-2.7	-2.1
Exchange rate (taka/\$, end period)	78.1	78.9	82.65	--	--	--

Note: \* denotes figures projected by IMF.

### C. Economic Outlook and Risks

2. Looking ahead, Bangladesh's GDP growth is projected at around seven percent, driven by strong domestic demand. Inflation is expected to remain around six percent as flood-related pressure on good prices eases with the rice harvest recovery. The current account deficit is projected to widen to around three percent with stronger import demand for food, industrial raw materials, and capital machinery, while remittances and exports start to recover. In the near-term, the main downside risks include the impact from global trade downturn, the Rohingya refugee crisis and a resumption of political unrest in the run up to the elections in December.

3. Bangladesh's risks of external debt distress and overall debt distress continue to be assessed as low. The external debt to GDP ratio is projected to remain stable around 18 percent in the medium term. Public debt to GDP ratio is expected to increase from 33.2 percent in FY2017 to 39 percent in FY2023, before trending down over the long term. It remains well within the benchmark value under the baseline and for all standard stress tests.<sup>22</sup>

<sup>22</sup> International Monetary Fund (IMF). 2018 Country Report No.18/158 2018 Article IV consultation – Press release; staff report; and statement by the executive director for Bangladesh, June 2018.

### **Annex 3. Economic and Financial Analysis**

1. This annex comprises three parts: (i) the economic analysis of the Project investments; (ii) the financial analysis of the Project investments; (iii) the financial assessment of PGCB, the implementation entity.

2. The scope of the Project includes the construction of 400 kV and 230 kV transmission lines with total length of 46 KM, two 230 kV substations, and two bay extensions. The investment will connect three new substations at Anowara, New Mooring and Khulshi in the Chittagong region. Upon completion, the transmission lines and associated substations will collectively provide 1,400 MVA transmission capacity at different voltage levels.

#### **A. Economic analysis**

##### **a. Methodology and Key Assumptions**

3. A cost-benefit analysis was carried out to assess the economic viability of the Project on a with- and without-project basis. Without the Project, it is assumed that unserved demand of the existing and new consumers will be met by self-generated power (e.g. diesel generators) at higher cost than grid supplied electricity. With the Project, additional power at cheaper cost will be made available to serve existing and new consumers in the Chittagong area which is already facing power shortages and load shedding.

4. It is assumed that the Project will operate 33 years after completion. Costs and benefits are estimated in constant 2018 prices. The exchange rate used is BT 83.75 per USD1.0.<sup>23</sup> Economic costs and benefits are derived from the financial cost estimates excluding taxes, financing charges and price contingency and applying the conversion factors. A social discount rate at 12 percent is applied as per the recommendation of the Planning Commission of Bangladesh.

##### **b. Economic Benefits**

5. The Project investments are expected to increase the network capacity to serve incremental load flow of 1,400 MW in Chittagong. The incremental load is projected to increase from 499 MW in 2023 to 1,392 MW in 2037 and thereafter, representing an average growth rate of 8 percent.<sup>24</sup> With average system load factor at 66.65 percent,<sup>25</sup> and after factoring in transmission and distribution losses at 2.7 and 9.3 percent, respectively, an estimated additional 2,573 GWh will be available to serve end users annually in 2023, growing to 7,179 GWh in 2037 and throughout the Project life.

6. The economic benefits are estimated using Willingness to Pay (WTP) for the additional power supply made possible by project investment. The WTP is estimated at USD0.198 per kWh, the weighted average WTP for two main consumption groups in Chittagong, industry and commercial consumers and residential consumers.

7. Industry and commercial consumers, accounting for about half of the total consumption, has an estimated WTP of USD0.27 per kWh, based on the cost of supply of small-scale diesel gensets with (i) 32 percent thermal efficiency, (ii) 70 percent utilization factor, (iii) capital cost of USD900 per kW, and (iv) fuel cost of high-speed diesel (HSD) at USD 0.776 (BDT 65.0) per liter.<sup>26</sup> For residential consumers which accounted for the other

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<sup>23</sup> Exchange rate as of July 2018.

<sup>24</sup> According to load forecast for New Mooring and Khulshi substations in the Power System Master Plan 2021.

<sup>25</sup> Bangladesh Power Development Board Annual Report (FY2016-017).

<sup>26</sup> Ibid.

half of the total consumption, the WTP is assumed at the retail tariff for the highest consumption tier at USD0.128 (BDT 10.7) per kWh.

### c. Economic Costs

8. **Capital costs.** The capital costs include investments in the transmission system which will be funded by the Project. The economic capital cost is estimated at USD 116.3 million including physical contingency. In addition, to be able to serve the end users, additional investment will be needed for upgrading low-voltage networks in the distribution system, which is assumed at roughly the same amount of investment in transmission. The total capital costs including investment in distribution network is about USD232 million.

9. **O&M costs.** The annual O&M costs are assumed at 2 percent and 5 percent of the capital costs, for the transmission and distribution investments, respectively. These estimates have taken into consideration higher O&M needs in the outer years to maintain the high voltage transmission system.

10. **Costs of incremental power supply.** The Project investment will enable evacuation of power generated from power plants under construction including a 300 MW HFO-fired combined cycle plant at Anowara, a 580MW LNG-fired CCGT capacity in Matarbari, and more generation capacity which will come online in the future according to the Power Development Plan. The cost of incremental power supply is estimated based on weighted average generation cost of gas-fired combined cycle gas turbine and HFO-fired power plants plus transmission and distribution costs.<sup>27</sup> The cost of incremental power supply is assumed to increase at annual average of 1.1 percent based on projected real price increase.<sup>28</sup>

### d. Summary of Results

11. Based on available data and assumptions adopted, in the base case scenario, the economic internal rate of return (EIRR) for the proposed Project is 56.6 percent and the net present value at social discount rate of 12 percent is USD1,408 million. The EIRR exceeds the hurdle rate of 12 percent and the project is considered economically viable.

12. **Sensitivity Analysis.** Given the uncertainties associated with various market and project-specific parameters, sensitivity study was carried out to assess the robustness of the economic viability of the Project investment. The economic viability of the Project investment is highly robust to withstand large variations in four scenarios: (i) 20 percent construction cost overruns; (ii) two years delay in commercial operation date (COD); (iii) 20 percent increase in cost of supply; and (iv) worst case scenario which is a combination of all the above. The analysis suggests that delay in COD has the highest impact on EIRR, hence, timely completion of construction and COD should be closely monitored. In addition, a sensitivity analysis was conducted using a more conservative estimate of WTP of USD0.159 per kWh, which is the weighted average of tariff for industrial and commercial consumers (USD0.191 or BDT 16.0 per kWh) and residential consumers (USD0.128 or BDT10.7 per kWh)<sup>29</sup>, of which each account for about 50 percent. The EIRR in this scenario also exceeds the hurdle rate of 12 percent. The results of the analysis are summarized below.

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<sup>27</sup> JICA 2016, Power & Energy Sector Master Plan.

<sup>28</sup> Ibid.

<sup>29</sup> Effective tariff rates as of December 1, 2017 according to the Bangladesh Energy Regulatory Commission.

**Table A3.1: Results of Economic Analysis**

No.	Sensitivity Scenario	EIRR	NPV (million USD)
1	Base Case	56.6%	1,408
2	20% increase in construction cost	52.8%	1,388
3	COD delay by 2 years	40.3%	1,177
4	Cost of power supply increase by 20%	44.4%	766
5	All of the above combined (2+3+4)	30.5%	583
6	Using conservative estimate of WTP based on current tariff	42.2%	1,168

## **B. Financial Analysis**

### **a. Methodology and Key Assumptions**

13. The financial analysis was carried out from the perspective of PGCB. Project costs include both investment costs and O&M costs in the transmission system. Project benefit is measured in terms of revenue from incremental wheeling charge from transmitted power which stands at USD 0.003 (BDT 0.2791) per kWh. Tariff are assumed to increase at four percent per annum on average based on historical adjustment and expected increase in the future based on discussion with PGCB. The financial costs included taxes, duties, contingencies and financing costs.

14. **Weighted Average Cost of Capital (WACC).** The Project investment will be financed by AIIB loan, the Government of Bangladesh and PGCB. AIIB loan (68 percent of total financing) is a USD-denominated loan with 20 years term including a grace period of five years at the interest rate of LIBOR plus fixed spread. AIIB loan will be on-lent from the government to PGCB at the rate of four percent. The remaining is financed by counterpart equity from Government of Bangladesh (26 percent) and PGCB (six percent). The cost of equity for the government is estimated based on long-term government treasury bill plus project risk and cost of equity for PGCB is based on dividend payout rate in FY2017. Therefore, WACC for the Project investment is estimated at 6.3 percent.

### **b. Summary of Results**

15. Based on the above assumptions, in the base case scenario with WACC at 6.3 percent, the Project investment yield a financial net present value of USD222 million, and a financial internal rate of return of 11.9 percent, exceeding the WACC. Therefore, the Project investment is financially viable.

16. **Sensitivity Analysis.** Sensitivity study is carried out to assess the robustness of the financial viability of the Project to withstand large variations in key market and project-specific parameters in four scenarios, including: (i) construction cost overruns; (ii) delays in COD; and (iii) construction cost overruns and COD delays; and (iv) tariff increase trajectory. The outcomes of the analysis indicate that the financial viability of the Project investment is robust against cost overruns and implementation delay; however, less so against no or tardy tariff adjustment which led to negative NPV. The analysis suggested the critical role of timely tariff adjustment to maintain positive financial return. The results of the analysis are summarized below.



**Table A3.2: Results of Financial Analysis**

No.	Sensitivity Scenario	FIRR	NPV (million USD)
1	Base Case	11.9%	222
2	20% increase in construction cost	10.2%	170
3	COD delay by 2 years	11.2%	203
4	Scenario 2+3	9.6%	151
5	No tariff increase	-	(108)

### C. Financial Assessment of PGCB

17. **Financial performance.** Over the period FY2013-2017, PGCB's revenues from wheeling charge increased from BDT 7,673 million to BDT 14,168 million, at a cumulative annual average growth rate of 16.6 percent. The growth in net income over the same period is faster albeit at an unsteady pace, resulting in widely varied profit margin from the low point of 0.34 percent in FY2014 to the high point of 14.1 percent in FY2017. PGCB has gradually reduced the transmission losses from 2.9 percent to 2.7 percent. Return on net fixed assets (ROA) first fell from 8.74 percent in FY2013 to a low of 3.20 percent in FY2014, before rebounding to the range of near 6.0 percent. The cyclical fashion of the profit margin and ROA is mainly due to delayed and insufficient increases in transmission tariff. The most recent tariff increase was made in September 2015<sup>30</sup> which increased the return on net fixed assets to 6.27 percent for FY2016.<sup>31</sup>

18. Review of the financial performance of PGCB suggested that the key risk to financial performance of PGCB is related to the transmission tariff.<sup>32</sup> The transmission tariff is fixed based on the principles and methodology approved by the Bangladesh Energy Regulatory Commission (BERC) in May 2016. The current methodology, which are based on commercial principles and aim to be cost-reflective, allows PGCB to earn return on assets covering interest, taxes and operation and maintenance costs. PGCB must submit tariff applications to BERC annually for approval. Nevertheless, PGCB is still exposed to tariff-related risks such as delayed tariff applications and approval and absence of capacity charges in the tariff methodology.<sup>33</sup>

<sup>30</sup> The increase was at BDT 0.05 per kWh.

<sup>31</sup> World Bank 2018, Enhancement and Strengthening of Power Transmission Network in Eastern Region Project.

<sup>32</sup> World Bank 2018, Enhancement and Strengthening of Power Transmission Network in Eastern Region Project and ADB 2018, Southwest Transmission Grid Expansion Project.

<sup>33</sup> Ibid.

**Table A3.3: PGCB's Financial Performance**

	Unit	2013	2014	2015	2016	2017	CAGR
<b>Key financial figures</b>							
Revenue - wheeling charge	Million BDT	7,673	8,465	9,133	12,524	14,168	16.6%
Profit before tax	Million BDT	2,015	571	72	2,291	2,876	9.3%
Profit after tax	Million BDT	1,010	29	416	1,226	1,996	18.6%
Gross fixed asset	Million BDT	88,453	127,746	139,402	144,214	177,169	19.0%
Current assets	million BDT	18,032	13,269	13,485	17,926	19,317	1.7%
Current liabilities	million BDT	11,649	16,343	5,220	5,787	6,959	-12.1%
Paid in capital	million BDT	4,609	4,609	4,609	4,609	4,609	-
<b>Ratios</b>							
Profit margin	%	13.16	0.34	4.55	9.79	14.09	
Return on average net fixed assets	%	8.74	4.96	3.20	6.27	5.97	
Debt service coverage	Times	1.90	1.11	1.99	2.26	2.56	
Debt/equity	Ratio	69/31	70/30	69/31	72/28	71/29	
Account receivable to sales		1.55	0.81	2.58	3.10	2.78	
Dividend per share	%	15	10	15	12	15	
Earnings per share	BDT	2.19	(0.06)	0.90	2.66	4.33	
Transmission loss	%	2.92	2.82	2.80	2.86	2.67	

## Annex 4: Project Delivery Strategy

### A. Strategic Assessment

1. The Project will strengthen the power transmission system in the Chittagong region and improve the reliability and quality of power supply in the system. The Project aims at meeting up the present and upcoming demand and ensuring reliable electricity supply to concerned urban and sub-urban areas. This will not only increase the transmission capacity of the system but also supply uninterrupted and good quality electricity to end users in Chittagong area, and thus achieving longer-term sustainability in electricity sector.

2. The Project Delivery Strategy will set out the Project's contract strategy and specific procurement approaches that aims to better fit the main procurement principles of Value for Money (VfM) and Fit for Purposes (FfP). It covers:

- **Component 1:** Procurement of material and equipment and necessary installation works including design, erection, testing and commissioning for Anowara-Ananda bazar (New Mooring) 400 kV double circuit overhead line portion: 20 km (Twin ACSR Finch Conductor).
- **Component 2:** Procurement of material and equipment and necessary installation works including design, erection, testing and commissioning for Anowara-Ananda bazar (New Mooring) 400 kV double circuit underground cable portion (2000 mm<sup>2</sup> XLPE) : seven km ; Line-in-line-out of Hathazari-Rampur 230 kV double circuit underground cable line (XLPE 2000 mm<sup>2</sup>) at Ananda bazar (New Mooring): three km and Madunaghat-Khulshi 230 kV double circuit underground cable line (XLPE 2000 mm<sup>2</sup>) :16 km.
- **Component 3:** Procurement of material and equipment and necessary installation works including design, erection, testing and commissioning for 230/132 kV GIS Substation: Ananda bazar (New Mooring) with 2x350/450 MVA 230/132 kV transformer; 230/132/33 kV GIS Substation: Khulshi with 2x350/450 MVA 230/132 kV and 3x80/120 MVA 132/33 kV transformer; Two nos. 230 kV GIS bay extension at Madunaghat Substation.

3. After Project completion, the grid transmission capacity of Chittagong area will be enhanced. Growing demand in Chittagong will be fulfilled with reliable power supply to industrial, commercial and residential load points. This will improve the voltage stability of 132 kV level at the transmission side and of 33 kV at the distribution side. As a result, voltage regulation will improve and voltage fluctuation at consumer end will be reduced. Load shedding will therefore be reduced, and new consumers can be connected to the system.

4. **Principles of Procurement Arrangement.** Procurement of goods, works, services contracts funded in part or in whole by AIIB shall be conducted in accordance with the requirements of AIIB's Policies for Procurement and Prohibited Practices, and AIIB's Interim Operational Directive on Procurement Instructions for Recipients (dated June 2, 2016). The major procurement activities under the Project would be three separate single-responsibility contracts for design, such as supply and installation of substations, overhead transmission lines and underground transmission lines (including design, supply of materials and equipment, foundation, erection, installation,

testing, commissioning, as a turnkey contract) and basic non-residential infrastructures.

5. **Project Management Unit (PMU).** PGCB is assigned by the Power Division, Ministry of Power, Energy & Mineral Resources to be responsible for the project implementation as well as any planning and development activities of national power grid. PMU will be set up to manage the project implementation from its inception to completion. The PMU will consist of 27 staff headed by a Project Director (at Superintending Engineer level). The PMU will be responsible for communication between AIB, government, and other relevant parties.

6. **Procurement Thresholds and Methods.** The Project will procure works and goods in accordance with the AIB's procurement requirements. International Open Competitive Tendering (IOCT) (single stage two envelop procedure) will be applied. The detailed procurement arrangement for each individual contract is indicated in the procurement plan.

7. **Standard Procurement Documents (SPD).** Subject to review and acceptance by AIB, format of SPDs issued by the Asian Development Bank may be followed for the project procurement, where applicable with some modifications and improvements for meeting the AIB's specific requirements. All requirements of Environmental and Social safeguards will be well addressed in the tender document. The AIB's procurement requirements such as eligibility, Conflict of interest, standstill period, notification of intention to award a contract, abnormally low-priced tenders, and prohibited practices policy and debarment list will be mandatory and reflected in the issued tender document.

8. **Contract Management.** All the necessary tender documents will be prepared, and the tendering activities will be undertaken by PGCB's Contract department. Contract management will be strengthened through close monitoring and supervision after contract signing. PMU will administrate and monitor contracts and their implementation with due diligence; and report to AIB on the performance of contractors. PMU will perform contract management as per the conditions stipulated in the contract document. PGCB's Design and Quality Control department will review the design documents submitted by the contractors.

9. **Primary line communication.** PGCB is the primary contracting agency and the principle decision organ will be Power Division. Arrangements for fund disbursements will be undertaken by the Economic Relations Division, Planning Commission, Finance Division and PGCB.

10. PGCB's capacity to execute the procurement has been assessed. PGCB is implementing a few projects of similar size and nature separately funded by the multilateral development banks (MDBs), such as World Bank and Asian Development Bank. It has sufficient capacity and experiences in implementing MDB funded projects and is familiar with the procurement policies of those MDBs. The AIB procurement requirements are materially consistent with the procurement policies of other MDBs. The PMU will be adequately resourced with professional staffs who have suitable experience of procurement under Multilateral Development Banks financed projects/programs. The PMU, Contract, Planning and Design departments of PGCB will be trained by the AIB procurement specialist during the project implementation to better meet AIB's requirements for the proposed Project, if needed.

## **B. Timelines**

11. Procurement process timelines are in Table A4.1 (Procurement Plan).

## C. Assessment of Operational Factors Affecting Procurement

12. Operational factors affecting procurement are as follows:

a) **Governance aspects:**

- Issues related to the confidentiality of the tender evaluation, allegations of fraud and corruption and delays in the procurement process may be occurred. The PMU will apply mitigation measures based on the lessons-learned from relevant projects financed by other MDBs.

- Social issues may cause procurement and construction delay if the PMU is not well-equipped to resolve the issues timely. Therefore, the Project's environmental and social measures and related management plans will be strictly followed and foreseen to be able to resolve the potential problem.

b) **Sustainability requirements:** Sustainability principles shall be considered in upcoming procurement, e.g. design should be better fit for ease of operation and maintenance, energy efficiency, grid reliability and environmental friendliness etc.

c) **Technological aspects:** PGCB has experience in assuming similar capacity when implementing government-funded projects. Most of infrastructure facilities and related technologies, required to conduct the proposed developments, are already available in the local and international engineering markets. However, it would be expected that the domestic construction industry will improve its capacity on new technologies to compete on the international standards.

## D. Supply Market Analysis

13. The Project will be constructed in three single responsibility contract packages, including design, supply, installation, testing and commissioning. The transmission lines of the Project will be constructed in two packages, one for overhead transmission line and the other for all underground cable. The third package is for all substations.

14. Based on previous experiences, competition for similar construction contracts among international and local contractors will be competitive and satisfactory as there are sufficient contractors able to undertake the required design, supply and installation contract. By applying the method of International Open Competitive Tendering, qualified international contractors can join and heighten the competition level. The Project implementation and the low-income beneficiaries will benefit more from this practice. In addition, local contractors will be able to compete with international contractors and encourage them further enhance their skills and knowledge.

15. According to PGCB's experience, design, supply, erection, testing and commissioning of equipment, construction materials and necessary work force needed by contractor are mostly available. The level of competition among suppliers is therefore high. PGCB has a good understanding of the supply market and the unit price in the market.

## E. Key Stakeholders

16. The key stakeholders and their main roles are as follows:

- PGCB/PMU – implementation entity to carry out the project implementation.
- Power Division – responsible for overseeing project implementation.

- ERD of MOF and the Ministry of Planning – responsible for arranging loan facility including authorizing disbursements under the loan.
- AIIB – responsible for loan disbursement and carrying out the fiduciary oversight of procurement activities under the Project. Primary line of communication will be with PGCB.
- EPC Contractors/Suppliers – responsible for contractual delivery.

#### **F. Recommended Procurement Approach**

17. Recommended procurement approaches are:
- All contracts (no threshold) to be procured under the Project will be tendered in accordance with the IOCT procedure required by AIIB. Single-Stage-Two-Envelope approach will be followed.
  - Procurement Plan has been generated in line with the Project’s needs and will be updated annually to (a) reflect project implementation, (b) accommodate changes that should be made; and (c) add new packages as needed for the Project. Applicable procurement methods for each specific contract are specified in the procurement plan depending on the nature, value and risk of each contract. Procurement plan and its updating or modification, including packaging, cost estimate, procurement method, prior review method, procurement timelines, standard bidding document to be used shall be subject to AIIB’s prior review and no-objection before the commencement of any contract which is updated, newly added, or repackaged.
  - PMU will conduct procurement progress review and construction quality check. All review findings and issues will be sent to AIIB for review. PMU will recommend the rectification measures to resolve the issues and improve the quality of procurement and constructions.
  - PMU will manage the contract payments based on the condition of contracts to avoid payment delay.
  - The proposed tendering and contracting strategy is considered to fulfill the value for money objective for the Project. The proposed procurement approach is therefore considered to be fit for the purpose.

#### **G. Risk and Mitigation Measures**

18. Key risks that may lead to delays in project implementation and/or non-compliance, if not properly mitigated, include: (i) lengthy internal procurement reviewing and approval processes within PGCB and relevant ministries; (ii) delay in contract management and loan negotiation at various stages; (iii) delays in getting environmental clearance; (iv) difficulties in having right of way for the construction of transmission line since project affected people may ask for a higher amount of compensation during the line construction (payable under the existing Electricity Act); (v) legal issues arising from land acquisition; and (vi) adverse climate condition like flood, cyclone, etc.

19. To mitigate these risks and strengthen the procurement capacity of PGCB/PMU, the following measures will be undertaken:

- PGCB/PMU will strengthen its capacity to operate the procurement procedures in fair, transparent and efficient manner that will enable successful delivery of the Project and its social objectives.
- The tender evaluation will be conducted in a suitable separate location from PGCB office to ensure minimal interruption and leakage of information.
- The tender evaluation will be conducted by a qualified team in which procurement specialist will closely work with technical expert.

- All three contracts will be submitted for AIIB's prior review, including tender documents and tender evaluation reports. The tender documents for subsequent construction contracts will follow the first tender documents without major change which have been reviewed and accepted by AIIB.
- Periodical progress monitoring, site inspection and supervision, monthly progress meeting, and record keeping are the tools PGCB is currently engaging.
- AIIB's Prohibited Practices Policy will be strictly followed to minimize the risk of corrupt and fraud practices; with the provision and application of appropriate and transparent mechanisms within procurement procedures. The AIIB's debarment list will be observed to ensure better governance.
- The implementation of the ESMP will be closely monitored.
- International market approach and single-stage two-envelope procedure will be applied to meet the requirement of Value for Money.

#### **H. Procurement Plan**

20. Procurement plan indicating the contract description, procurement method, cost estimate, review procedure and tender invitation dates are in the following table.

**Table A4.1: Project Procurement Plan**

Revision No: 01

Date: Nov. 22, 2018

No.	Ctr. No.	Contract Description	Unit	Qty	Estimated Value (US \$ Mn)	Fund Source	Procurement Category	Method	Review by Bank	Tender Invitation (MM/YY)	Contract Awarding (MM/YY)	Contract Period (Months)
1	PGCB - PSUE P-W1	Design, Supply and Installation of Anowara-Ananda 400KV double circuit overhead Line: 20 km	km	20	12.18	AiIB	Works	IOCT (single stage two envelope, ADB's SBD for Procurement of Plant design, Supply & Installation)	Prior	Sep./2019	June/2020	24 months
2	PGCB-PSUE P-W2	Design, Supply and Installation of underground cables, including: (i) Anowara-Ananda bazar 400 kV double circuit, 7 km; (ii) Line-in-line-out of Hathazari-Rampur 230 kV double circuit at Ananda bazar (New Mooring), 3 km; and (iii) Madunaghat-Khulshi 230 kV double circuit, 16km.	km	26	59.44	AiIB	Works	IOCT (single stage two envelope, ADB SBD for Procurement of Plant design, Supply & Installation)	Prior	Sep./2019	June/2020	24 months
3	PGCB-PSUE P-W3	Design, supply & installation of substations, including: (i) 230/132 kV GIS Substation at Ananda bazar (New Mooring) with 2x350/450 MVA 230/132 kV transformer; (ii) 230/132/33 kV GIS Substation at Khulshi with 2x350/450 MVA 230/132 kV and 3x80/120 MVA 132/33 kV transformer; and (iii) two 230 kV GIS bay extension at Madunaghat Substation	Nos.	lot	38.24	AiIB	Works	IOCT (single stage two envelopes, ADB SBD for Procurement of Plant design, Supply & Installation)	Prior	Sep./2019	June/2020	24 months
<b>TOTAL</b>					<b>109.86</b>							



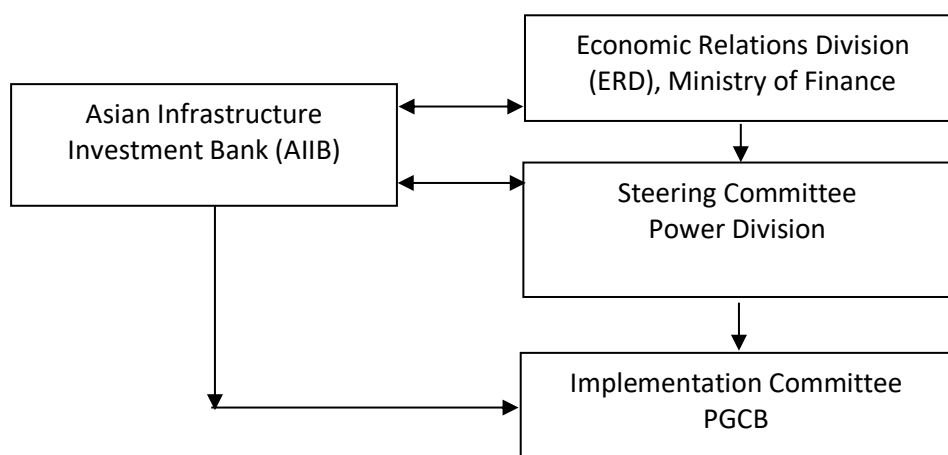
## Annex 5: Project Implementation Arrangement

### A. Management Structure

1. The organizational structure of the Project implementation is shown below. The Steering Committee, which comprises of high-level officials from Power Division and related ministries, will oversee the project implementation and guide the settling of all implementation issues. The implementation committee, which includes key officials from PGCB, will be responsible for the project implementation.

2. After loan approval, PGCB will set up a PMU to do the daily implementation work. The PMU, which is headed by a senior official and staffed by adequate personnel, is responsible for (i) overall project management and monitoring; (ii) annual budget preparation and monitoring of utilization of loan proceeds; (iii) progress reporting, including reports on cost management and project outputs; and (iv) compliance with loan covenants. The PMU will also be responsible for procurement of goods and services, recruitment of consultants, and engineering and construction contractors.

**Figure A5.1: Organizational Structure**



**B. Composition of Project Steering Committee and Terms of References**

<b>No.</b>	<b>Representatives</b>	<b>Position</b>
1	Secretary, Power Division	Chairperson
2	Additional Secretary (Planning Wing), Power Division	Member
3	Additional Secretary (Development Wing), Power Division	Member
4	Joint Chief (Planning Wing), Power Division	Member
5	Managing Director, PGCB	Member
6	Deputy Chief (Planning Wing), Power Division	Member
7	Representative of NEC-ECNEC & Coordination Wing of the Planning Division	Member
8	Representative of the Industry and Energy Division, Planning Commission	Member
9	Representative of IMED	Member
10	Representative of Programming Division, Planning Commission	Member
11	Representative of Finance Division	Member
12	Representative of ERD	Member
13	Representative from the Planning Department, PGCB	Member
14	Project Director	Member
15	Senior Assistant Chief/ Assistant Chief (Planning Wing), Power Division	Member Secretary

**Terms of Reference:**

To review the recommendation of the project implementation committee for addressing problems that arise during project implementation and to take decision accordingly.

To give guideline or to formulate policies which required for implementation of project activities.

Any other matter related to project implementation.

The committee will meet at least once in every three months.

The committee may cooperate with members, if necessary.

**C. Composition of Project Implementation Committee and Terms of References**

<b>No.</b>	<b>Representatives</b>	<b>Position</b>
1	Managing Director, PGCB	Chairperson
2	Representative from the Planning Wing, Power Division	Member
3	Representative from the Development Wing, Power Division	Member
4	Representative from the Industry and Energy Division, Planning Commission	Member
5	Representative from the Programming Division, Planning Commission	Member
6	Representative of NEC-ECNEC & Coordination Wing of the Planning Division	Member
7	Representative from IMED	Member
8	Representative from ERD	Member
9	Representative from Finance Division	Member
10	Project Director	Member
11	Representative from Design Department, PGCB	Member
12	Desk Officer from concerned Project, PGCB	Member Secretary

**Terms of Reference:**

To give necessary assistance or suggestion for implementing project activities.

If any problem arises during project implementation, then to give necessary decision to solve the problem.

The committee will meet at least once in every three months.

The committee may cooperate with members, if necessary.

## D. Organization Chart of Project Implementation

