ASIAN INFRASTRUCTURE INVESTMENT BANK

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Project Document
of the Asian Infrastructure Investment Bank

Sovereign-backed Financings

People's Republic of Bangladesh

Dhaka and Western Zone Transmission Grid Expansion Project

Currency Equivalents

(as of 2 July 2019)
Currency unit – Taka (Tk)

Tk1.00 = US$0.0118
US$1.00 = Tk 84.52

Borrower's Fiscal year

July 1 – June 30 (next year)

Abbreviations

ADB	–	Asian Development Bank
AIIB	–	Asian Infrastructure Investment Bank
EMP	–	Environmental Management Plan
ESS	–	Environment and Social Standard
FY	–	fiscal year
GDP	–	gross domestic product
GW	–	Gigawatt
IE	–	Implementation entity
IEE	–	Initial Environmental Examination
km	–	kilometer
kV	–	Kilovolt
kWh	–	kilowatt-hour
MW	–	megawatt
MVA	–	megavolt-ampere
O&M	–	operation and maintenance
PGCB	–	Power Grid Company of Bangladesh
PMU	–	project management unit
PP	–	Procurement Policy
RP	–	Resettlement Plan

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1. Summary Sheet

People's Republic of Bangladesh
Dhaka and Western Zone Transmission Grid Expansion Project

Project No.	000272
Borrower	People's Republic of Bangladesh (Bangladesh)
Project Implementation Entity	Power Grid Company of Bangladesh (PGCB)
Sector Subsector	Energy Electricity Transmission and Distribution
Project Objective	The proposed Project is to enhance the reliability and efficiency of power transmission in Dhaka and Western Zone of Bangladesh.
Project Description	The proposed Project will include three components. • Component 1: construction of substations with a total capacity of 4,450 MVA and transmission lines of 40 km in Greater Dhaka. • Component 2: construction of substations with a total capacity of 3,070 MVA and transmission lines of 368 km and 20 bay extensions in Western Zone. • Component 3: Institutional capacity of PGCB strengthened.
Implementation Period	Start Date: October 2019 End Date: June 2024
Expected Loan Closing Date	December 31, 2024
Cost and Financing Plan	Project cost: USD750 million Financing Plan: AIIB loan: USD 200 million ADB loan: USD 300 million People's Republic of China Poverty Reduction and Regional Cooperation Fund: USD0.75 million Borrower/PGCB: 249.25 million
Size and Terms of AIIB Loan	USD 200 million, with a maturity of 25 years, including a grace period of 5 years.
Cofinancing (Size and Terms)	ADB: parallel co-financing of USD300 million, with a maturity of 25 years, including a grace period of 5 years. People's Republic of China Poverty Reduction and Regional Cooperation Fund: grant of USD0.75 million, administered by ADB.
Environmental and Social Category	Category A
Risk (Low/Medium/High)	Medium

Conditions for Effectiveness	• Cross-effectiveness with ADB Loan Agreement. • Signing of Co-lenders' Agreement with ADB. • Signing of subsidiary loan agreement between the Borrower and PGCB.
Key Covenants	The Borrower shall or shall cause PGCB to ensure that the preparation, design, construction, implementation, operation and decommissioning of the Project and all Project facilities comply with: (a) all applicable laws and regulations of the Borrower relating to environment, health, and safety; and (b) all measures and requirements set forth in the Initial Environmental Examination, Environmental Management Plan, Resettlement Plan and Corrective Action Plan. The Borrower shall: (a) ensure that PGCB files a tariff application at least once a year to ensure PGCB's financial sustainability; and (b) request and require the Bangladesh Electricity Regulatory Commission to review such tariff applications in a timely manner in accordance with the Bangladesh Energy Regulatory Commission Act, 2003 (as amended from time to time).
Retroactive Financing (Loan % and dates)	Retroactive financing will be up to 20 percent of the Loan amount to finance expenditures incurred not earlier than 12 months before the signing date of the loan agreement.
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.

President	Jin Liqun
Vice President	D.J. Pandian
Director General	Yee Ean Pang
Manager	Rajat Misra
Team Leader	Hongliang Yang, Principal Investment Operations Specialist
Team Members	Haiyan Wang, Senior Finance Officer Irish Fe Aguilar, Social Development Specialist Julius Thaler, Senior Counsel Ning Wu, Financial Management Specialist Yan Li, Senior Economist Yunlong Liu, Procurement Specialist Zhaojing Mu, Environmental Specialist Zhixi Zhu, Environmental Specialist Kunyuan Hu, Project Assistant

2. Project Description

A. Rationale

1. **Country Priority.** Bangladesh has maintained an impressive growth rate of more than six percent annually in last decade with gross national income per capita rising steadily from US$800 in 2010 to US$1,750 in 2018. [1] Bangladesh fulfilled all three eligibility criteria for graduation from the United Nation's Least Developed Countries list for the first time in 2018 and is on track for graduation in 2024. The structure of its national economy is shifting from agriculture to manufacturing and services. Sustained economic growth has rapidly increased the demand for infrastructure such as energy, transport, and water supply and sanitation. Despite its recent achievements, Bangladesh still needs substantial efforts on many fronts, such as addressing persistent infrastructure deficits and adapting to climate change. Addressing these development issues is currently on top of the country's policy agenda.

2. Bangladesh's infrastructure is experiencing considerable pressure from its rapid industrialization and urbanization. The successful management of industrialization and urbanization requires secure and reliable power supply. The Government of Bangladesh has set a target to provide electricity for all by 2021. In line with this target, sizeable investments in the power sector have been prioritized to increase power generation capacity, as well as improve and extend the power transmission and distribution (T&D) network[2]. Bangladesh's Seventh Five Year Plan (FY2016-FY2020) sets out an integrated development strategy for the greater Dhaka area and Western Zone covering Dhaka, Khulna, and Barishal.[3]

3. Bangladesh is a country highly vulnerable to the adverse impacts of extreme weather such as cyclones and flooding, and will be even more so due to climate change, particularly from sea level rise, extreme precipitation and fiercer and more frequent cyclones. Two-thirds of the country are located at less than five meters above sea level and more than 700 rivers run through its land. If the sea level were to rise by one meter, about 10 percent of its land would be flooded.[4] Consequently, changes in extreme weather events caused by climate change will affect the sustainability of current and future power infrastructure and the profitability of sector entities. Therefore, the potential impacts of climate change have to be considered and addressed in the design and construction of the T&D infrastructure to make it more climate-resilient.

4. **Institutional Context**. Inadequate and unreliable power supply impedes Bangladesh's economic performance, reduces its business competitiveness and

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[1] World Bank Group (WBG), 2019. Country Snapshot for Bangladesh (July 2019).
[2] Power Division, Government of Bangladesh, 2016. Power System Master Plan 2016. Dhaka, Bangladesh.
[3] Planning Commission of the Government of Bangladesh, 2015. Seventh Five-Year Plan (FY2016-2020): Accelerating Growth, Empowering Citizens.
[4] Ali, A (1996). Vulnerability of Bangladesh to climate change and sea level rise through tropical cyclones and storm surges. Water, Air, & Soil Pollution. 92 (1–2): 171–79.

productivity and seriously affects the quality of life of Bangladeshis. In 2017 annual power consumption per capita in the country was only about 375 kilowatt-hour (kWh).[5] Compared with the world average per capita annual power consumption of about 3,125 kWh in 2014, Bangladesh's power sector still has a long way to go. Aside from the power generation shortfall, due to lack of investments and insufficient maintenance, the reliability of the network deteriorated over time, resulting in frequent system collapses. As per the World Economic Forum, in 2018 out of 137 countries, Bangladesh was ranked 109th on overall infrastructure, 108th on electrification rate and 71st on power transmission and distribution losses.[6] 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.[7]

5. The Government of Bangladesh has implemented 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;[8] and (iv) constructing cross-border transmission lines to import power from neighboring countries, such as India and Nepal. Given these efforts, more households have been connected to the grid. In 2017, about 22% of the population in Bangladesh still lack access to electricity.[9] Since the national figure masks a stark urban-rural disparity, the situation of electricity access in rural areas can be much worse. The Government of Bangladesh plans to increase the installed generation capacity to 24 gigawatt (GW) by 2021 and reach 60 GW by 2041.[10]

6. The development of the T&D network has not kept pace with the growth of generation capacity and demand in Bangladesh for years. A considerable portion of transmission lines and substations are overloaded due to the rapid growth of power demand and the insufficient investment in the T&D network. This causes frequent collapses of major equipment and network failures, leading to deteriorating system reliability. Recent investments in network strengthening and the measures taken to reduce non-technical losses have resulted in a significant decline in overall system losses, from over 30 percent in the 1990s to about 13 percent in 2018 according to official statistics.[11] However, compared to the figures in other economies (for example, system losses in China was only about 6.4 percent in 2017)[12], there is significant scope for Bangladesh to improve its power system performance. The high system losses undermine the financial health of power sector entities and their capacity to contribute

[5] Power Cell, Government of Bangladesh, 2018. Power Sector at a Glance. Dhaka, Bangladesh.
[6] World Economic Forum, 2018. The Global Competitiveness Report 2018.
[7] World Bank, 2018. Enhancement and Strengthening of Power Transmission Network in Eastern Region Project.
[8] Bangladesh currently has more than 5 million solar home systems installed, the largest number globally.
[9] World Bank Database: Access to Electricity (% of population). Access on July 9, 2019. https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=BD&view=chart.
[10] Power Division, Government of Bangladesh, 2016. Power System Master Plan (2016). Supported by Japan International Cooperation Agency.
[11] Power Grid Company of Bangladesh, 2018. PGCB at A Glance.
[12] The system loss in China was about 6.4 percent in 2017. China Electric Council, 2018. National Power Industry Statistics Bulletin 2017. Beijing.

to the country's development target. There is therefore an urgent need for development intervention in T&D network.

7. The Power Grid Company of Bangladesh Limited (PGCB), a state-owned enterprise established in 1996 under the Companies Act (Bangladesh), 1994, is currently the only entity responsible for operating and developing power transmission networks in the country. It owned 11,311 circuit-km of transmission lines and about 34,587 megavolt-ampere (MVA) transformer capacity at different voltage levels as at December 2018.[13] PGCB has recently undertaken several projects to build more than 3,000 km of new transmission lines and 106 new substations by 2020 and plans to add another 3,000 km of transmission lines and 90 substations by 2025. With increasing demand for a more efficient and reliable power supply, PGCB needs to concentrate not only on new investments but also on improvement of performance of its existing assets.

8. The proposed Project is in line with the country's development priorities and sector development plan. The Project area covers some important agricultural production regions, where, due to the shortage of efficient irrigation infrastructure and insufficient surface water supply, agricultural cultivation mostly depends on ground water. Peak demand for power always emerges during the irrigation season. Since there is not enough generating capacity locally, power is currently being transmitted from distant regions via the 132 kV transmission lines. Factors, such as long distance, low transmission voltage, high demand and inadequate reactive power compensation, have caused severe voltage drops, resulting in low water pumping rates and damages to electrical facilities in the Project area. Moreover, power demand in the Western Zone is expected to rise steadily soon after the ongoing transport corridor linking the southwest region to the greater Dhaka area is completed, which is expected to promote a greater integration of local markets with the rest of the country.

9. **Strategic fit for AIIB.** The proposed Project is aligned with AIIB's mandate and its Energy Sector Strategy in terms of promoting energy access and security, realizing energy efficiency potential, and reducing the carbon intensity of energy supply. Supplementing AIIB's Financing for Bangladesh's southeastern region,[14] the proposed Project will finance the construction of the needed transmission lines and substations in Dhaka and the Western Zone. It is therefore a signature of AIIB's strong and sustained support for the expansion and enhancement of the power transmission network in Bangladesh. Besides, the proposed Project will help the power sector tackle climate change impacts, making the grid more climate resilient.

10. **Value addition by AIIB.** AIIB's involvement will add substantial value in project preparation and implementation. Firstly, AIIB's long-term financing support will help the client reduce the Project's financing uncertainty and move the Project forward more quickly. Secondly, the Project will use innovative designs and advanced efficient conductor technology to make the network more climate resilient and efficient. Thirdly,

[13] Power Grid Company of Bangladesh (PGCB), 2018. PGCB at A Glance.
[14] Bangladesh Power System Upgrade and Expansion Project (PD000088-BGD). 2018.

it will pilot an unmanned aerial vehicle (UAV) application for transmission line inspection. The technology will be used for the first time in Bangladesh and has potential to upgrade PGCB's performance on transmission network maintenance to a higher level and reduce potential safety risks substantially. Fourthly, AIIB's participation will help PGCB strengthen its institutional capacity and improve project quality by applying international environmental and social standards and good practices. Last, due to AIIB's participation, universal procurement will apply to all contracts under the Project, including those financed by the Asian Development Bank (ADB). This will increase the competition for Project tendering and lead to a more cost-effective result.

11. **Value addition to AIIB**. Through the proposed Project, AIIB will continue to strengthen its institutional capacity and knowledge with respect to power transmission. The proposed Project will increase AIIB's presence in the power sector of Bangladesh. This will enhance the quality and strength of cooperation between the Government of Bangladesh and AIIB. Also, the Project will deepen AIIB's institutional understanding of how to conduct climate resilient investments in power transmission.

B. Project Objective and Expected Results

12. **Project Objective.** The proposed Project is to enhance the reliability and efficiency of power transmission in Dhaka and Western Zone of Bangladesh.

13. **Expected Results.** Upon completion, the Project is expected to deliver the following results: by 2025,

- Annual power outages reduced to 15 (2018 baseline: 60).
- Transmission loss reduced to 2.50% (2018 baseline: 2.76%).
- Annual carbon dioxide emissions reduced (unit: 1000 tons): 455.78.

14. **Expected Beneficiaries.** Due to lack of investment and inadequate maintenance, the aging and inadequate T&D systems impose severe constraints on the power supply to consumers. Most manufacturing and service firms in Bangladesh identified the shortage of reliable power supply as the biggest constraint to their operations. The proposed Project is expected to help the country achieve its target to provide electricity for all by 2021 and supply uninterrupted electricity to industries by 2020.

C. Description and Components

15. An extended and upgraded transmission network will not only reduce the technical loss of the transmission system but also enhance the reliability of the power supply in Bangladesh. The proposed Project will include the following components. [15]

Component 1: Expansion of the transmission system in Greater Dhaka. The Project will construct and commission 400/132 kV substations with a total capacity of 4,450 MVA and transmission lines of 40 km in Greater Dhaka.

[15] Project scope may be changed somewhat during the process of governmental approval.

Component 2: Expansion of the transmission system in Western Zone. The Project will construct and commission 230/132/33 kV substations with a total capacity of 3,070 MVA, transmission lines of 368 km and 20 bay extensions in Western Zone**.**

Component 3: Strengthening of Institutional capacity of PGCB. The Project will enhance capacity by: (a) supporting installation and operation of an enterprise resource planning (ERP) system to assist PGCB in optimally managing its capital-intensive assets; (b) establishing a UAV Inspection Center within the operation and maintenance department of PGCB. The Project aims to promote gender inclusive practices in PGCB by employing women for at least 20 percent of the technical positions in the UAV Inspection Center and training 80 staff (at least 20 percent women) in operating UAV and ERP systems.

D. Cost and Financing Plan

16. The Project's cost estimate is about USD750 million. Table 1 shows the Project's cost estimate and financing plan.

Table 1: Project Cost Estimate and Financing Plan

Item	AIIB		ADB		Grant		GoB/PGCB		Total
	Amount	%	Amount	%	Amount	%	Amount	%	
A. Base Costs									
1.Civil works and installation	40.87	34.0	72.02	60.0	-	-	7.23	6.0	120.12
2. Mechanical and equipment	147.90	30.8	191.37	39.9	0.65	0.1	139.99	29.2	479.91
3. Consulting services	-	-	0.64	68.8	0.07	7.5	0.22	23.7	0.93
4. Land acquisition and resettlement	-	-	-	-	-	-	21.86	100	21.86
B. Recurrent costs									
Administration cost	-	-	-	-	-	-	9.25	100	9.25
C. Contingencies									
1. Physical	3.78	29.9	5.27	41.7	0.03	0.23	3.57	28.2	12.65
2. Price	5.06	13.4	29.12	77.1	-	-	3.57	9.5	37.75
D. Financing Charges During Construction *	2.39	3.5	1.58	2.4	-	-	63.56	94.1	67.53
Total (A+B+C+D)	**200.00**	**26.7**	**300.00**	**40.0**	**0.75**	**0.1**	**249.25**	**33.2**	**750.00**

17. The Government of Bangladesh has requested a loan of USD200 million to help finance the Project. The loan will have a 25-year term, including a grace period of 5 years, at AIIB's standard interest rate for sovereign-backed loans with the corresponding weighted average maturity. The loan will be made to the People's Republic of Bangladesh, and the Government of Bangladesh will onlend the loan proceeds to PGCB through a subsidiary loan agreement under terms and conditions acceptable to AIIB.

18. The Project will be co-financed by ADB and the People's Republic of China Poverty Reduction and Regional Cooperation Fund. ADB's loan of USD300 million will have a 25-year term, including a grace period of 5 years, with an annual interest rate determined in accordance with ADB's London interbank offered rate (LIBOR)-based

lending facility. The People's Republic of China Poverty Reduction and Regional Cooperation Fund will provide a grant not exceeding USD0.75 million to finance procurement of UAV (i.e. drones) and training, workshops and other capacity-building activities.

19. The Government of Bangladesh will provide financing to cover national taxes and duties, remuneration of counterpart staff and other in-kind contributions. The balance of the Project's cost, if there is any, will be covered by the Government of Bangladesh and/or PGCB.

20. **Climate Finance**. Climate mitigation is estimated to cost $197.2 million and climate adaptation is estimated to cost $117.8 million. AIIB will finance 40.6% ($80.0 million) of mitigation costs and 40.0% ($47.1 million) of adaptation costs. ADB will finance 59.4% ($117.2 million) of mitigation costs and 60.0% ($70.7 million) of adaptation costs. Please refer to Annex 6 for details.

E. Implementation Arrangements

21. PGCB will be responsible for the implementation of all designed Project activities and will set up a Project Management Unit (PMU) to manage the daily work of Project implementation after loan approval. Power Division of the Government of Bangladesh will designate a senior officer to oversee the Project implementation and resolution of implementation issues. The planned implementation arrangements are summarized in Table 2.

Table 2: Implementation Arrangements

Aspects	**Arrangements**
Project implementation period	October 2019 – June 2024
Expected completion date	June 30, 2024
Loan closing date	December 31, 2024
Project Management	
(i) Oversight body	Project Steering Committee, chaired by Additional Secretary of Power Division, participated by Bangladesh's Ministry of Finance, Ministry of Planning, Bangladesh Power Development Board, and PGCB.
(ii) Implementation entity	PGCB
(iii) Project Management Unit (PMU)	Established after loan approval
Procurement: goods and works	International open competitive tendering, 3 contracts financed by AIIB and 6 contracts by ADB.
Retroactive financing and advance contracting	Eligible contract packages and expenditures agreed may be considered for retroactive financing, which will be up to 20 percent of the loan amount to finance expenditures incurred not earlier than 12 months from the signing date of the loan agreement.
Disbursement	AIIB's loan proceeds will be disbursed in accordance with the detailed arrangements agreed between Bangladesh and AIIB/ADB.

22. **Monitoring and Evaluation.** As per the existing practice in Bangladesh, Power Division of the Government of Bangladesh will review the Project's monthly progress reports submitted by PGCB. PGCB will submit to ADB and AIIB quarterly 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.

23. **Implementation Support.** ADB and AIIB will conduct project review missions on a regular basis; AIIB will do so at least annually. In case of any compliance discrepancy identified during project implementation, a corrective plan will be developed and implemented to resume compliance.

24. **Procurement.** To facilitate the loan administration, the Government of Bangladesh requested AIIB-financed packages to be administered by ADB and therefore to be governed by ADB's Procurement Policy and Regulations for ADB Borrowers (2017) (ADB's PP). This approach is consistent with AIIB's Procurement Policy (AIIB's PP). Although the PP only anticipates the use of a co-financier's policy in cases of joint financing with the co-financier, the application of ADB's PP in this case of parallel cofinancing is equally justified. We consider that AIIB's PP did not intend to exclude application of the cofinancier's policy in cases such as this one. In this case, AIIB has determined that ADB's PP is consistent with the Bank's Core Procurement Principles and Procurement Standards, ADB has agreed in its cofinancing arrangements with AIIB to the application of ADB's PP for all Project contracts, including those financed by AIIB, and PGCB is quite familiar with ADB's PP. As such, all goods, works and consulting services financed by both the ADB loan and the AIIB loan will be procured in accordance with ADB's PP (as amended from time to time). 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 Procurement Plan has been prepared by PGCB and accepted by ADB. According to the Procurement Plan, the Project will be divided into specific, identifiable contract packages, which will then be separately financed by AIIB and ADB (For details, please refer to Annex 5). Universal procurement will apply to all procurement packages to be financed by ADB and AIIB.

25. **Financial Management.** ADB will provide FM services to AIIB's Loan in accordance with the provisions of the Project-specific arrangements between AIIB and ADB. Bangladesh and PGCB will ensure that all expenditures financed out of the loan proceeds are used exclusively in carrying out the Project and Bangladesh will exercise its rights in such manner as to protect its interests and those of AIIB and to accomplish the purposes of the Loan. PGCB will maintain separate books and records by funding source for all expenditures incurred under the Project following the cash-based accounting system. It has an accounting system which is adequate for the recording of all relevant financial transactions of the Project. The detailed Project financial

statements will be audited in accordance with International Standards on Auditing as adopted by the Institute of Chartered Accountants of Bangladesh by an independent auditor acceptable to ADB and AIIB or in accordance with International Standards for Supreme Audit Institutions as issued by the International Organization of Supreme Audit Institutions. The audited project financial statements together with the auditor's opinion will be presented in the English language to ADB and AIIB within 6 months following the end of the fiscal year by PGCB.

26. **Disbursement**. 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 Bangladesh should submit to ADB and AIIB sufficient evidence of the authority of the person(s) who will sign the withdrawal applications on behalf of Bangladesh, together with the authenticated specimen signatures of each authorized person.

3. Project Assessment

A. Technical

27. 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 April 2019. PGCB has a proven track record in financing and implementing similar power transmission projects, including those financed by development partners. The transmission lines and substations to be built under the Project are decided against the forecasted demand in each geographic region. The selected voltage levels, technology and equipment under the Project are compatible with PGCB's existing system assets and international good practices.

28. **Climate Change**. An assessment on climate related risks has been conducted and the results and recommendations have been incorporated into the Project design. To address climate change related issues, such as flooding and overheating of transmission lines, indoor gas-insulated substations (GIS) and high-efficiency high-temperature low sag conductors are applied under the Project. This will contribute not only to climate mitigation by reducing transmission losses, thereby reducing carbon emissions, but also to climate adaptation through using indoor GIS to strengthen the system's power supply reliability.

B. Economic and Financial Analysis

29. **Economic Analysis**. A cost-benefit analysis was carried out to assess the economic viability of the Project on a with- and without-project basis over a project lifetime of 33 years inclusive of a 5-year construction period. Economic costs and benefits are measured in constant 2019 prices, excluding transfer payments, financing charges, and adjustments for market distortions. Costs and benefits are estimated with an average exchange rate of BDT84.12/US$. A social discount rate at 12 percent is

applied as per the recommendation of the Planning Commission of the Government of Bangladesh.

30. Without the Project, the transmission grids in both Project regions are severely constrained, raising cost of supply with pricey local substitutes, leaving some existing demand unserved while suppressing future growth. With the Project, additional power at lower cost will be served to existing and new consumers in the Project regions. The economic benefits are estimated using Willingness-to-Pay (WTP) for the additional power supply made possible from three main consumption groups, namely residential, industry and commercial consumers. The Project's economic costs include capital investments in the transmission system to be supported by the Project and associated investments in the distribution system needed to serve the end users. Recurrent costs include operation and maintenance (O&M) costs of the transmission and distribution systems as well as cost of power supply.

31. Based on available data and assumptions adopted, in the base case scenario, the economic internal rate of return (EIRR) for the Project is 20.3 percent and its net present value at social discount rate of 12 percent is USD983 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) 15 percent construction cost overruns; (ii) two years delay in commercial operation date (COD); (iii) 15 percent less power served; (iv) 15 percent increase in cost of supply; and (v) worst case scenario which is a combination of all the above. The results of the analysis are provided in more details in Annex 3.

32. **Financial Analysis.** The financial analysis was carried out from the perspective of PGCB. Project costs include both investment costs and operation and maintenance (O&M) costs of the transmission system only, which included taxes, duties, contingencies and financing costs. Project benefit is measured in terms of revenue from incremental wheeling charge. The analysis assumes that when the project investments commence operation, the wheeling charge: (i) will have been adjusted to a level in line with BERC's tariff guidelines; and (ii) will be adjusted on a regular basis following the same guideline. All revenues and costs are valued in nominal terms with unit cost growing at the rate of inflation.

33. Based on the above assumptions, in the base case scenario with the Weighted Average Cost of Capital (WACC) at 5.2 percent, the Project investment yields a financial net present value of USD729 million, and a financial internal rate of return (FIRR) of 10.1 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) 15 percent construction cost overruns; (ii) two years delay in COD; (iii) 15 percent less additional power supplied; and (iv) a combination of all the above. The results of the analysis are provided in more details in Annex 3.

34. **Financial Assessment of PGCB**. Over the period FY2014-2018, PGCB's revenues from wheeling charge increased at a cumulative annual average growth rate of 14.9 percent. The growth in net income over the same period is faster albeit at an unsteady pace, resulting in widely varied profit margin and return on net fixed assets. This is mainly due to delayed and insufficient increases in the wheeling charge, coupled with lower capacity utilization of the transmission assets. The current tariff methodology allows PGCB to earn return on assets covering interest, taxes and O&M costs. To keep its wheeling charge cost-reflective, PGCB must regularly submit tariff applications once a year to the Bangladesh Energy Regulatory Commission to adjust the tariff. Undertakings have been included in the legal agreements requiring PGCB to file a tariff application at least once a year to ensure PGCB's financial sustainability; and requiring the Bangladesh Electricity Regulatory Commission to review such tariff applications in a timely manner in accordance with the Bangladesh Energy Regulatory Commission Act, 2003 (as amended from time to time). PGCB's financial figures are provided in Annex 3.

C. Fiduciary and Governance

35. **Procurement**. PGCB is implementing projects of similar size and nature, which are separately financed by the World Bank and ADB. Its procurement staff are familiar with the procurement policies of those financial institutions, including procurement methods, processes and procedures, standard bidding documents. PGCB has sufficient capacity to carry out the procurement of works, goods, and consulting services under the proposed Project in accordance with ADB's Procurement policies and procedures.

36. **Financial Management**. The financial management assessment was conducted in April 2019 by ADB following ADB's guidelines and methodologies. PGCB has rich experience working with international development partners. It has adequate technical and planning capabilities to prepare plans and budgets for its projects and a well-established project management setup at present. PGCB's independent auditor reported that: (i) PGCB had complied with the conditions of the corporate governance code except some conditions; (ii) PGCB had complied with the provisions of the relevant Bangladesh Secretarial Standard; (iii) proper books of records had been kept as required under the Companies Act by PGCB; and (iv) the governance of PGCB was satisfactory. However, PCGB does not have a fully integrated computerized Management Information System (MIS) and accounting system, and its in-house internal audit department needs to be strengthened. While there are aspects of the accounting system to be improved, the Bank noted that the current system can capture transactions by financing sources. To further mitigate the financial management risk, an action plan for financial management has been prepared under the guidance of ADB and will be executed during the Project implementation. Based on the assessment, the key financial management risks identified are moderate, although the pre-mitigation risks might be substantial.

37. **Governance and Anti-corruption**. PGCB has established procedures for internal and external audit. Bangladesh and PGCB will ensure that proper accounts and records of use of loan proceeds are maintained and audited in a timely manner.

PGCB has agreed to further strengthen its auditing systems as required by ADB and AIIB. ADB's Anticorruption Policy (1998, as amended to date) has been provided to Bangladesh and PGCB and a covenant regarding compliance with this policy as well as AIIB's Policy on Prohibited Practices has been included in the legal agreements. Implementation will be monitored regularly by ADB. AIIB reserves the right to investigate – directly or indirectly through its agents – any allegations covered by AIIB's Policy on Prohibited Practices (2016) that are additional to those covered by ADB's Anticorruption Policy.

D. Environmental and Social

38. **Environment and Social Policy and Categorization**. Because this Project will be co-financed with ADB, AIIB has agreed with ADB that: (a) ADB's Safeguard Policy Statement (SPS), 2009 and related procedures of ADB will apply to the Project; and (b) AIIB may rely on ADB's determination as to whether compliance with those policies and procedures have been achieved under the Project. AIIB is satisfied that: (i) ADB's SPS and its related procedures are consistent with AIIB's Articles of Agreement and materially consistent with AIIB's Environmental and Social Policy (ESP); and (ii) appropriate monitoring procedures are in place for the Project.

39. Under ADB's SPS, the Project has been categorized as Category B for environment, considering that the impacts will be temporary and reversible in nature, Category A for involuntary resettlement, and Category C for Indigenous Peoples. An Initial Environmental Examination (IEE) accompanied by an Environmental Management Plan (EMP) and a Resettlement Plan (RP) have been prepared to meet the requirements of ADB's SPS. They were reviewed by AIIB and found to be satisfactory.

40. **Environment Aspects**. The Project is expected to generate socioeconomic benefits in terms of ensuring adequate and reliable power supply in Dhaka and the Western Zone. No ecologically sensitive habitats or national protected areas are found in the Project area. However, potential negative impacts caused by the proposed transmission lines and substations are expected to occur mostly during the construction stage, including impacts of landfilling for substations, soil erosion, temporary and permanent loss of floodplain fish habitat and production[16], relocation of one tube well, traffic and public utilities disturbance, air pollution, noise, solid wastes and tree cutting as well as community and occupational health and safety issues. In areas where removal of trees is unavoidable, tree planting with a ratio of 1:3 will be undertaken[17].

41. To minimize the impact of overhead transmission lines crossing rivers, the transmission tower platforms will be placed 150m away from the river bank alongside the wider rivers with single wire spans across the river. The EMP delineates the mitigation measures for the identified risks and adverse impacts. In addition, the EMP

[16] Please see the compensation for loss of fish ponds in the Social Aspects below.
[17] Please see the compensation for tree loss in the Social Aspects below.

also includes a monitoring plan, budget and reporting mechanism and describes the roles and responsibilities of the key institutions for its implementation. An Environmental Audit has also been carried out for existing substations including a time bound Corrective Action Plan (CAP) that PGCB needs to implement. The EMP and CAP will be included in construction contracts. Site-specific EMPs with quantified impacts and their mitigation measures will be prepared by contractors and endorsed by PGCB prior to access to the sites being permitted.

42. **Social Aspects**. The locations of new substations and bay extensions, as well as the alignment of transmission lines, have been carefully selected by PGCB to minimize land acquisition and involuntary resettlement. The Project requires 79.6 acres of land for 14 new substations and bay extension in one existing substation. Land acquisition will not result in physical displacement as identified parcels of land are largely used for agricultural purposes. However, it will cause permanent economic displacement of 321 households. Of the 281 households covered by the census, 218 are expected to be significantly affected by the loss of more than 10% of their productive assets. A total of 142 tenants and sharecroppers are likewise expected to be affected by land acquisition.

43. The total length of the transmission lines is about 408 km with a 12m-width clearance corridor for the overhead transmission lines. Neither overhead nor underground transmission lines will require land acquisition.[18] An area of 1043.7 acres within the clearing width of the right of way (RoW) for the overhead transmission lines will have as a permanent impact loss of trees, and as temporary impacts loss of crops, which will affect an estimated 870 households. Construction work for the transmission lines will have an impact on an estimated 20% of 403 built structures comprising 260 primary structures[19] and 143 auxiliary structures belonging to 108 households and 11 institutions. Properties belonging to the 11 institutions are large-scale commercial businesses and common property resources.[20] The underground transmission lines with a total length of 14km in the Dhaka area will follow the RoW of existing roads and are not expected to cause any temporary or permanent adverse impacts, as the cables will be laid along road shoulders or centers.

44. The RP provides compensation commensurate to the impacts and additional allowances to vulnerable and severely affected households to restore their livelihood. The entitlement matrix summarizes the main types of losses and the corresponding entitlements in accordance with the legal framework of the Government (Acquisition and Requisition of Immovable Property Act of 2017) and ADB's SPS. The resettlement budget provides for payment of compensation at replacement cost and includes

[18] Landowners affected by the transmission tower foundation areas will be compensated for the land required for the four tower footings. Landowners whose land is within the right of way corridor still retain their ownership and use it for residential and cultivation purposes provided the vertical clearance requirement (5m for 132 kV; 6m for 230 kV; and 7.5m for 400 kV) is maintained after construction.
[19] These comprise residential structures, small and large-scale commercial establishments and common property resources,
[20] Common property resources comprise mosques, graveyards, Eidgah fjeld (a place used by people for prayers on special occasions) and 1 madarasa school.

compensation for land used for tower foundations, as well as trees, crops and fishponds along the transmission lines' RoW. It also provides compensation for any partial damage caused to primary structures and partial or full damage caused to auxiliary structures within the RoW, which require restoration either in the same location or in the remaining portion of the land. The budget also makes provisions for additional resettlement assistance for vulnerable and significantly affected households.[21] Furthermore, provisions have been made to cover the costs of conducting consultations, updating the resettlement plan, grievance redress and monitoring. The resettlement budget is estimated at Tk 1,990,409,594 of which a substantial portion will be absorbed by the compensation for affected land and trees. The RP is based on preliminary engineering designs and any change in Project scope based on the detailed and final engineering design will require the RP to be updated accordingly. PGCB will conduct a full census of all affected persons and prepare a corresponding inventory of losses based on final designs. RP implementation will be monitored by PGCB, which assured allocation of adequate resources to complete land acquisition and compensation before commencing any civil works.

45. The Project does not affect dignity, human rights, livelihood systems or culture and territories of Indigenous Peoples as defined by the ADB. ADB, AIIB and PGCB have conducted relevant due diligence and confirmed that no Indigenous Peoples, as defined by ADB's SPS, were found within the Project area.

46. **Gender.** The Project will employ women in at least 20% of the technical positions in the drone inspection center and provide training to about 80 PGCB staff of which 20% are women on operating drone and on the Enterprise Resource Planning system.[22] The RP has identified women-headed households living below the poverty line of Tk 102,000 per annum and provides for commensurate assistance for the same.[23] Separate community consultations were also held for women in the Project area.

47. **Occupational Health and Safety, Labor and Employment Conditions**. PGCB will ensure that contractors and Operation and Maintenance Agencies provide adequate health and safety measures for their workers, and bidding documents include clauses on how contractors are to address the health and safety requirements. PGCB will also require that civil works contractors comply with all applicable labor laws and regulations and adopt and enforce codes of conduct for all workers.

48. **Stakeholder Consultation and Information Disclosure**. Community level public consultations were conducted in 40 different locations in the Project areas with groups of men and women, community-based organizations, and members of the local

[21] Vulnerable households include (i) households living below the official poverty line; (ii) female-headed households living below the poverty line; (iii) households by elderly over 70 years or disabled persons; and (iv) households without legal title to land and to become landless due to land acquisition. Significantly affected households are households losing more than 10% of their land assets.
[22] Grant provided by People's Republic of China Poverty Reduction and Regional Cooperation Fund.
[23] These include special assistance such as a one-time grant per household.

government authorities (union parishad) to disclose information about the proposed Project and its various subcomponents and elicit their views and concerns. Out of 1,127 consulted, 238 were women. PGCB will continue their communications with the affected persons and other stakeholders and disclose Project information. Brochures and posters containing relevant information have been printed in Bengali and made available/displayed at places easily accessible to affected persons and other interested parties. The IEE (including the EMP) and RP have been disclosed on PGCB's website[24] as well as on the websites of ADB[25] and AIIB[26]. A translation in Bengali of the Project Information Booklet, which includes the Entitlement Matrix of the RP, and the Executive Summary of IEE in Bengali have been be made available for public information in Project areas and posted on PGCB's website. [27]

49. **Project Grievance Redress Mechanism (GRM)**. A three-tier GRM will be established and implemented by PGCB at field, local community and PMU levels. Communities and individuals who believe that they are adversely affected by the Project may submit complaints to these project-level grievance redress mechanisms.

50. **Use of ADB's Independent Accountability Mechanism**. As noted above, ADB's SPS will apply to this Project instead of AIIB's ESP. Pursuant to AIIB's agreement with ADB, AIIB will rely on ADB's independent accountability mechanism, the Accountability Mechanism, to handle complaints relating to environmental and social issues that may arise under the Project.[28] Consequently, in accordance with AIIB's Policy on the Project-affected People's Mechanism (PPM), submissions to the PPM under the Project will not be eligible for consideration by the PPM. ADB's Accountability Mechanism is designed to ensure that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to ADB's Complaint Receiving Officer and choose between problem solving function or compliance review function. A description of good faith efforts made with the operations department to address the issue raised must be provided by the complainant to initiate the compliance review process. Complaints may be submitted at any time after concerns have been brought directly to the attention of ADB's operation department, and its Management has been given an opportunity to respond. For information on how to submit complaints to ADB's Accountability Mechanism, please visit: https://www.adb.org/site/accountability-mechanism/main.

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[24] http://pgcb.gov.bd/site/page/a6ed9231-ba45-4545-ae2e-96370e65ccc1/-
[25] https://www.adb.org/projects/51137-003/main#project-documents
[26] https://www.aiib.org/en/projects/proposed/2019/dhaka-western-zone.html
[27] Relevant project information has been disseminated during consultations and surveys in the local language. Translation of the Project Information Booklet (https://www.pgcb.org.bd/PGCB/upload/ESIA/RP_booklet_in_bengali_version_of_Dhaka_and_Western_Zone_Transmission_Grid_Expansion_Project_(ADB%20Version).pdf) and Executive Summary of the IEE (https://www.pgcb.org.bd/PGCB/upload/ESIA/EXECUTIVE_SUMMARY_in_bengali_version_of_Dhaka_and_Western_Zone_Transmission_Grid_Expansion_Project_(ADB%20Version).pdf) have been posted on PGCB's website.
[28] Either through the problem-solving function of the Office of the Special Project Facilitator or the compliance review function of the Compliance Review Panel.

51. **Monitoring and Supervision Arrangements**. PGCB will be responsible for overall coordination, supervision and monitoring of the Project's environmental and social aspects. PGCB has an environmental and social unit and is experienced in implementing the EMP and RP for ADB-financed projects. The PMU shall likewise have one environment and one social staff responsible for monitoring. Given ADB's requirement for Category A project, an external monitoring consultant will verify social monitoring reports of PGCB. Semi-annually, Environmental and Social monitoring reports will be submitted to ADB and AIIB, and disclosed on ADB's website.[29] AIIB staff will conduct site visits at least annually, together with ADB missions where feasible.

E. Risks and Mitigation Measures

52. The Project's Risk Rating is "Medium", as no major uncontrollable technical, environmental, or social risks have been identified at present. The proposed Project comprises regular interventions to improve the power transmission network, with which PGCB is familiar. Risk assessment and mitigating measures are presented in Table 3.

Table 3: Risk Assessment and Mitigation Measures

Risk Description	Assessment	Mitigation Measures
Implementation delay	Medium	A PMU will be set up by PGCB to lead the project implementation after loan approval, headed by senior engineers and staffed by adequate personnel. Also, large value procurement packages will be prepared to attract international and domestic specialized contractors to participate in the tendering. Furthermore, project implementation will be closely monitored by ADB and AIIB project review missions on a regular basis.
Price increase in goods and materials leading to cost overrun	Medium	Costs of major items are benchmarked to similar ongoing projects in Bangladesh, and provision of sufficient amount is included for contingencies. The Government and PGCB have confirmed that any financing shortfalls will be covered.
Inadequate implementation of EMP and RP	Medium	Safeguard instruments will be included in the tendering documents and terms of reference for supervision consultants and contractors. The PMU shall have one environment and one social staff responsible for monitoring the implementation of EMP and RP. Project review missions will be conducted at least annually to visit the Project sites.

[29] ADB shall share semi-annual reports submitted by PGCB for AIIB's review and disclosure on AIIB website.

Risk Description	Assessment	Mitigation Measures
Insufficient transmission wheeling charges	Medium	Tariff regulations issued by Bangladesh Energy Regulatory Committee (BERC) in June 2016 allow PGCB to file periodically for tariff adjustment to cover costs (once a year). Covenants requiring PGCB to file annual tariff applications to ensure PGCB's financial sustainability; and requiring BERC to review them in a timely manner are included.
Limited financial management capacity	Medium	Relevant covenants and conditions have been included in the legal agreements to ensure that proper accounts and records are maintained and audited in a timely manner to adequately identify the use of loan proceeds.
Overall Rating	**Medium**	

Annex 1: Results Monitoring Framework

Project Objective:	The proposed Project is to enhance the reliability and efficiency of power transmission in Dhaka and Western Zone of Bangladesh.										
Indicator Name	**Unit**	**Base-line** 2018	**Cumulative Target Values**						**End Target**	**Frequency**	**Responsibility**
			2020	2021	2022	2023	2024	2025			
Project Objective Indicators:											
1. Power outages reduced	No.	60	-	-	-	-	20	15	15	Annually	PGCB
2. Transmission loss reduced	%	2.76	-	-	-	-	2.60	2.50	2.5	Annually	
3. Annual Carbon dioxide emissions reduced (average)	1000 tons	0	-	-	-	-	-	455.78	455.78	Annully	
Intermediate Results Indicators:											
1. Transmission lines constructed (400kV, 230kV, 132kV)	km	0	0	0	50	200	408	408	408	Semi-annually	PGCB
2. Line-bay extensions completed	No.	0	0	0	0	10	20	20	20	Semi-annually	
3. transmission capacity added	MVA	0	0	0	0	0	7,520	7,520	7,520	Semi-annually	

Annex 2: Detailed Project Description

1. The Project area will comprise twenty districts in five administrative divisions of Bangladesh: Barishal Division (Bhola District, Jhalokaki District and Pirojpur District), Dhaka Division (Dhaka District, Faridpur District, Gazipur District, Gopalganj District, Madaripur District, Narayangonj District), Khulna Division (Bagerhat District, Jessore District, Jhenaidah District, Khulna District, Kustia District, Meherpur District, and Satkhira District), Rajshahi Division (Noagoan) and Rangpur Division (Dinajpur District, Lalmonirhat District and Nilphamari District). Barishal Division, Khulna Division, and the Faridpur, Madaripur and Gopalganj Districts of Dhaka Division, located south of Padma River and can be grouped as Southwest Bangladesh, while Rajshahi Division and Rangpur Division bordering Jamuna River and Padma River can be grouped as Northwest Bangladesh. Southwest and Northwest Bangladesh together form the Western Zone of Bangladesh.

2. The Government of Bangladesh has prioritized the power sector development and has taken a large initiative to build a country wide power network (transmission & distribution) targeting to reach electricity for all by 2021. According to the Bangladesh Power System Master Plan (PSMP), a transmission system capable of supplying 19,900 MW electricity throughout the country is essential by 2025. [30] To realize the planned target, PGCB has undertaken various projects to expand and strengthen the national grid in order to meet the proliferating demand for electricity throughout the country.

3. The proposed Project is in line with the country's development priorities and sector development plan. The Project area covers some important agricultural regions, where, due to inadequate surface water supply, agricultural cultivation mostly depends on ground water. Peak demand for electricity always comes during the irrigation season. Since there is insufficient power generating capacity locally, power is currently being transmitted from distant regions via the 132 kV transmission lines. Factors, such as long distance, low transmission voltage, high demand and inadequate reactive power compensation, have caused severe voltage drops, resulting in low water pumping rates and damages to electrical facilities in the project area. Moreover, power demand in the Western Zone is expected to rise steadily soon after the ongoing transport corridor linking the southwest region to the greater Dhaka area is completed, which is expected to promote a greater integration of local markets with the rest of the country.

4. Due to lack of investment and inadequate maintenance, the aging and inadequate T&D systems impose severe constraints on power supply to consumers. Most manufacturing and service firms in Bangladesh identified the shortage of reliable power supply as the biggest constraint to their operations. The proposed Project is

[30] Power Division, Government of Bangladesh, 2016. Power System Master Plan (2016). Supported by Japan International Cooperation Agency.

expected to help the country achieve its target to provide electricity for all by 2021 and supply uninterrupted electricity to industries by 2020. [31]

5. An extended and upgraded transmission network will not only reduce the technical losses of transmission system but also enhance the reliability of the power supply in Bangladesh. The proposed Project will include the following components and activities.

Component 1: Expansion of the Transmission System in Greater Dhaka

6. The following will be constructed under Component 1: (i) Kaliganj (Gazipur) 400/230 kV, 2x750 MVA indoor GIS substation; (ii) Purbachal 400/230 kV, 3x750 MVA indoor GIS substation; (iii) Purbachal-2 230/132 kV, 2x350/450 MVA indoor GIS substation; (iv) 18 km Kaliganj (Gazipur)-Purbachal 400 kV double circuit (D/C) transmission line; (v) 5 km Purbachal-Purbachal-2 230 kV D/C underground transmission cable with 0.5 km overhead transmission line section; (vi) 9 km Basundhara-Rampura 132 kV D/C underground transmission cable; (vii) 0.5 km line-in line-out (LILO) connection from Bhulta-Kaliakair 400 kV D/C transmission line to Kaliganj (Gazipur) substation; (viii) 3.5 km LILO connection from Ghorashal-Tongi 400 kV D/C transmission line to Kaliganj (Gazipur) substation; and (ix) 3.5 km LILO connection from Ghorashal-Tongi 230 kV D/C transmission line to Kaliganj (Gazipur) substation.

Component 2: Expansion of the Transmission System in Western Zone

7. The following will be constructed under Component 2: (i) Bhola 230/33 kV, 2x120/140 MVA indoor GIS substation; (ii) Rupsha 230/132 kV, 3x250/350 MVA and 132/33 kV, 3x80/120 MVA indoor GIS substation; (iii) Bhanga 132/33 kV, 3x80/120 MVA indoor GIS substation; (iv) Domar 132/33 kV, 2x80/120 MVA indoor GIS substation; (v) Hatibanda 132/33 kV, 2x80/120 MVA indoor GIS substation; (vi) Jhalokathi 132/33 kV, 2x80/120 MVA indoor GIS substation; (vii) Maheshpur 132/33 kV, 2x80/120 MVA indoor GIS substation; (viii) Monirampur 132/33 kV, 2x80/120 MVA indoor GIS substation; (ix) Meherpur 132/33 kV, 2x80/120 MVA indoor GIS substation; (x) Phultola 132/33 kV, 3x80/120 MVA indoor GIS substation; (xi) Pirojpur 132/33 kV, 2x80/120 MVA indoor GIS substation; (xii) Shibchar 132/33 kV, 3x80/120 MVA indoor GIS substation; (xiii) 62 km Rupsha-Satkhira 230 kV D/C transmission line; (xiv) 46.5 km Domar-Purba Sadipur 230 kV D/C transmission line; (xv) 35 km Domar-Hatibanda 132 kV D/C transmission line; (xvi) 28 km Kaliganj-Maheshpur 132 kV double circuit transmission line; (xvii) 33 km Monirampur-Satkhira 132 kV D/C transmission line; (xviii) 48 km Kushtia-Meherpur 132 kV D/C transmission line; (xix) 49.5 km Bagerhat-Pirojpur-Bhandaria 132 kV D/C transmission line; (xx) 25 km Gopalganj (North)-Shibchar 230 kV D/C transmission line; (xxi) 32.5 km Niyamatpur-Patnitala 132 kV D/C transmission line; (xxii) 1 km LILO connection from Barishal-Bhola-Burhanuddin 230 kV D/C transmission line to Bhola substation; (xxiii) 3.5 km LILO connection from

[31] Government of Bangladesh, Ministry of Planning, Planning Commission. 2012. *Perspective Plan of Bangladesh, 2010–2021: Making Vision 2021 a Reality.* Dhaka; Government of Bangladesh; Ministry of Power, Energy and Mineral Resources. 2016*. Power System Master Plan 2016*. Dhaka.

Bagerhat-Goalpara 132 kV D/C transmission line to Rupsha substation; (xxiv) 0.5 km LILO connection from Gallamari-Gopalganj 132 kV D/C transmission line to Rupsha substation; (xxv) 0.5 km LILO connection from Khulna (South)-Rupsha power plant 230 kV D/C transmission line to Rupsha substation; (xxvi) 0.5 km LILO connection from Faridpur-Madaripur 132 kV D/C transmission line to Bhanga substation; (xxvii) 1.5 km LILO connection from Barishal-Bhandaria 132 kV D/C transmission line to Jhalokathi substation; (xxviii) 1 km LILO connection from Khulna Central-Noapara 132 kV D/C transmission line to Phultola substation; (xxix) four 132 kV bay extensions at Satkhira substation; (xxx) two 132 kV outdoor GIS bay extensions at Purba Sadipur substation; (xxxi) two 132 kV bay extensions at Kaliganj substation; (xxxii) two 132 kV bay extensions at Kushtia substation; (xxxiii) two 132 kV bay extensions at Bagerhat substation; (xxxiv) two 132 kV outdoor GIS bay extensions at Bhandaria substation; (xxxv) two 132 kV bay extensions at Gopalganj (North) substation; (xxxvi) two 132 kV bay extensions at Niyamatpur substation; and (xxxvii) two 132 kV bay extensions at Patnitala substation.

Component 3: Strengthening of Institutional Capacity of PGCB

8. Component 3 will strengthen PGCB's capacity through: (i) supporting installation and operation of an Enterprise Resource Planning (ERP) System to assist PGCB in optimally managing its capital-intensive assets; (ii) establishing a UAV Inspection Center within the Operation and Maintenance Department of PGCB, with some gender inclusive elements (at least 20 percent women in UAV Inspection Center).

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 the implementing utilities.

I. Economic analysis

a. Program Overview

2. The Greater Dhaka region has a population of 13 million. Served by two power distribution utilities, namely Dhaka Power Distribution Company (DPDC) and Dhaka Electric Supply Company (DESCO,) the region accounted for about a quarter of the national bulk power sales in FY2017, growing at average annual rate of 6.6 percent in the 5-year period of 2012-17. The area is more developed than the rest of the country with more established industries and commercial businesses, accounting for approximately 60 percent of total electricity consumption.

3. The Western Zone comprises three regions, namely Rangpur, Khulna and Barishal. The upcoming completion of the Pamada Bridge will have a transformative impact on the region's economy, boosting industrial activities within the region, turning it into one of the country's home bases for large economic zones. The region's demand for electricity has been growing rapidly. The West Zone Power Distribution Company (WZPGCL), one of the region's distribution utilities, has been recording an average annual growth of 8.2 percent over the 5-year period of 2012-17.

4. In both regions, power supply has not been able to keep up with demand growth. Much of the growing demand remains unserved due to supply shortages and network inefficiencies. In spite of a suite of demand-side management (DSM) measures in place, load shedding remains a persistent issue.[32] It is expected that by 2024, around 3,000 MW base load capacity will come online in the West Zone to address the supply shortage situation of the region and nationwide. Corresponding grid investments are needed to facility this capacity expansion in distribution network.

5. On top of supply shortages, the reliability of the power supply has also been deteriorating. (Table 1) Due to a lack of investment and inadequate maintenance, the aging and overloaded transmission and distribution (T&D) systems impose severe constraints on power delivery to consumers. Power outages have become increasingly rampant resulting in about 2–3 percent loss of GDP per year, with significant sums spent on diesel generators for backup. As in many countries of South Asia, a majority of manufacturing and service firms in the region identify a shortage of reliable electricity as the most important constraint they face to smooth operations and expansion.

[32] Bangladesh Power Development Board Annual Report (FY2016-017).

Table A3.1: Interruptions of national grid (minutes)

	FY2013	FY2014	FY2015	FY2016	FY2017
Partial failure due to generation	404	415	520	717	1,086
Partial failure due to S/S	293	839	17	-	767
Partial failure due to transmission	-	-	22	310	453
Partial failure due to the lightning	162	25	228	-	-
Partial grid failure	13	13	-	-	41
Total grid failure	-	-	655	-	-
Total	**872**	**1,292**	**1,442**	**1,027**	**2,347**

Source: Bangladesh Power Development Board Annual Reports (FY2013-FY2017)

6. The Project will (i) expand the transmission network and capacity in the northern Dhaka area by constructing substations with 4,450 MVA and 40km of double-circuit transmission lines; (ii) expand the transmission network and capacity of the West Zone by constructing substations with 3,070 MVA and 368 km double-circuit transmission lines; and (iii) strengthen the institutional capacity of Power Grid Company of Bangladesh Limited (PGCB) through installation of an enterprise resource planning system and establishment of a drone inspection center.

7. The proposed investments are part of the power sector long-term least-cost plan identified in the Government's Power System Management Plan (PSMP) 2016.

b. Methodologies and key assumptions

8. **Cost-benefit analysis and key assumptions.** A cost-benefit analysis is carried out to assess the economic viability of the Project on a with- and without-project basis, over a project lifetime of 33 years inclusive of a 5-year construction period, at a social discount rate of 12 percent. Economic costs and benefits are derived from the financial cost estimates with adjustments to allow for transfer payments, financing charges and corrections for any market distortions. A shadow wage factor of 0.82 is used. All costs and benefits are estimated in constant 2019 prices with an average exchange rate of BDT 84.12/US$.

9. **Project cost.** The economic costs of the project comprise the following components:

- *Investment costs*. For the Project to achieve its system-wide impact, additional investment of approximately equal amount is needed for upgrading low-voltage networks. After subtracting duties, VAT, financing charges, and adjustment for market distortions, the total capital cost comes up to US$987.7 million. For local cost, a 0.82 shadow wage factor is applied.

- *Operating and maintenance (O&M) costs.* The annual O&M costs are assumed at 2.0 percent and 5.0 percent of the capital costs, for the transmission and distribution investments, respectively;

- *Costs of incremental power supply*. More generation capacity is planned to

come online in the future, which the project investment will partly support. The incremental power supply will enter the network at an estimated US¢8.7 per kWh.[33] After factoring in transmission-loss (T-loss) of 2.6 percent[34] and distribution-loss (D-loss) of 9.3 percent,[35] the cost of supply to the end user is estimated at US¢9.9 per kWh.

10. **Project benefits.** The project will expand the capacity of the grid to:

- Meet the unserved demand from all customer segments in the project area, especially in the West Zone, where demand growth has been especially suppressed due to capacity constraints and frequent load shedding.

- Displace higher cost supply sources with lower cost, grid-based power supply. To avoid frequent outages and load shedding, many industries operate on captive generators; and businesses, on standby diesel generators. To quickly address the shortages in generation capacity, Bangladesh has been employing smaller power plants, mostly oil-fired, on rental basis or on short-term power purchase agreements.

- Strengthen the reliability of the power network and reduce non-technical losses of the overall system, while lowering the weighted average cost of grid-based power supply.

11. ***Demand projection and the additional demand served by the project***. Demand projections are carried out for the project regions assuming that they continue on the current growth trajectory. Based on the demand projection, power supply schedule is estimated on with- and without project basis, taking into account system capacity constraints. The additional demand served by the project is estimated as the difference between the two scenarios.

12. ***Willingness to pay (WTP)*** for the additional power supply made possible by the project investment is valued at WTP, estimated at US¢16.2 per kWh based on the weighted average of three consumption groups:

- *Residential customers,* accounting for approximately 40 percent of the total demand in the project areas, has an estimated WTP of US¢11.1(BDT 9.3) per kWh, conservatively assumed at the residential retail tariff for the second highest consumption block of 400-600 kWh/month;

- *Industrial customers,* accounting for approximately 45 percent of the total demand in the project area, has an estimated WTP of US¢19.2 (BDT 16.2)

[33] Bangladesh Power Development Board Annual Report (FY2016-017)
[34] Power Grid Company of Bangladesh Annual Report (FY2017-2018)
[35] Ibid

per kWh, conservatively assumed as the average of the cost of supply from small-scale diesel gensets and the retail tariff to industrial customers;[36]

- *Commercial customers,* accounting for approximately 15 percent of the total demand in the project area, has an estimated WTP at US¢20.7 (BDT 17.4) per kWh, conservatively assumed as the average of the cost of supply from small-scale diesel gensets and the retail tariff to commercial customers;

13. **Outcome of the economic analysis.** Based on the above assumptions, in the base case scenario with a discount rate of 12 percent, the Project investment yield an economic net present value (ENPV) of US$983 million, and an economic internal rate of return (EIRR) of 20.3 percent, exceeding the hurdle rate. Therefore, the project investment is economically viable.

Table A3.2: Outcome of the economic analysis

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	...	2051
Incremental load and power supply														
Incremental - Component 1	*GWh*	-	-	-	-	-	14	1,304	2,400	2,633	3,173	3,742	7,662	7,662
Incremental - Component 1	*GWh*	-	-	-	-	-	28	98	214	415	784	1,300	4,432	4,432
Incremental - Component 1&2	*GWh*	-	-	-	-	-	42	1,402	2,614	3,048	3,956	5,042	12,094	12,094
Costs														
Project investment in transmission	*million USD*	(29.6)	(78.9)	(148.0)	(172.7)	(64.1)	-	-	-	-	-	-	-	-
Investment in lower voltage networks	*million USD*	-	(29.6)	(78.9)	(148.0)	(172.7)	(64.1)	-	-	-	-	-	-	-
O&M cost - transmission	*million USD*	-	-	-	-	(9.9)	(9.9)	(9.9)	(9.9)	(9.9)	(9.9)	(9.9)	(9.9)	(9.9)
O&M cost - distribution	*million USD*	-	-	-	-	(21.5)	(24.7)	(24.7)	(24.7)	(24.7)	(24.7)	(24.7)	(24.7)	(24.7)
Cost of supply to end users	*million USD*	-	-	-	-	-	(4.2)	(138.9)	(258.9)	(302.0)	(391.9)	(499.5)	(1,198.0)	(1,198.0)
Sub-total	*million USD*	(29.6)	(108.5)	(226.9)	(320.6)	(268.1)	(102.8)	(173.4)	(293.5)	(336.5)	(426.4)	(534.0)	(1,232.6)	(1,232.6)
Benefits														
Power supply at WTP	*million USD*	-	-	-	-	-	6.8	226.7	422.6	492.8	639.6	815.2	1,955.3	1,955.3
Sub-total	*million USD*	-	-	-	-	-	6.8	226.7	422.6	492.8	639.6	815.2	1,955.3	1,955.3
Net benefit	*million USD*	**(29.6)**	**(108.5)**	**(226.9)**	**(320.6)**	**(268.1)**	**(96.0)**	**53.3**	**129.1**	**156.3**	**213.2**	**281.2**	**722.7**	**722.7**

ENPV	*million USD*	**983**
EIRR	*%*	***20.3%***

14. **Sensitivity analysis**. 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 analysis the economic viability of the project investment is highly robust to withstand large variations in key market and project-specific parameters, including (i) construction cost overruns; (ii) commercial operation day (COD) delays; (iii) additional power served; (iv) cost of power supply; and (v) worst case scenario which is a combination of all the above. The outcomes of the analysis confirm the robustness of the economic viability of the Project investment. The outcomes of the analysis are summarized below.

[36] The cost of supply from small-scale diesel gensets is estimated based on the following assumptions: (i) 32 percent thermal efficiency; (ii) 70 percent utilization factor; (iii) capital cost of US$900 per kW; and (iv) fuel cost of high speed diesel at US$0.225 (BDT 65.0) per liter

Table A3.3: Sensitivity analysis – EIRR

	EIRR (%)	ENPV at 12%
Base case	20.3%	US$983 million
[1] Investment cost +15%	18.7%	US$860 million
[2] COD 2-year delay	16.7%	US$587million
[3] Additional power served -15%	18.4%	US$712 million
[4] Cost of power supply +15%	17.3%	US$555 million
[1] + [2] + [3] + [4]	11.7%	US$31 million

II. Financial analysis

a. Methodology and key assumptions

15. The financial analysis was carried out from the perspective of the Power Grid Company of Bangladesh (PGCB). Project costs include both investment costs and O&M costs. Project benefit is measured in terms of revenue from incremental wheeling charge from the Project intervention. All revenues and costs are valued in nominal terms with unit cost growing at the rate of inflation.

16. **Project financing and the weighted average cost of capital (WACC).** The total project financing of US$750 million comprises (i) US$500 million US dollar denominated loans from ADB (US$300 million) and AIIB (US$200 million) with rate linked to the London interbank offered rate (LIBOR), currently standing at 4.0 percent per annum[37]; (ii) US$79.68 million local currency loan from the Government of Bangladesh at 3.0 percent; (iii) US$169.57 equivalent in equity from PGCB with a 9.9 percent, the most recently auctioned 20–year treasury bond rate plus a premium of 1.5%; and (iv) US$750,000 grant contribution from the People's Republic of China.[38] Thus, WACC for the Project is estimated at a pre-tax 5.2 percent in nominal terms.

17. **Wheeling charge.** At BDT 0.2791(US¢0.328) per kWh, the wheeling charge has not been raised since FY2015. Historically, in the absence of an approved tariff methodology, PGCB has not been able to revise the wheeling charge on a regular basis to reflect increasing costs. In 2016, Bangladesh Energy Regulatory Commission (BERC) introduced a cost-plus scheme to serve as the basis for periodic revision of the wheeling charge. This analysis assumes that when the project investments start in operation, the wheeling charge (i) will have been adjusted to the level in line with BERC's tariff guidelines; and (ii) will be adjusted on a regular basis following the same guideline. ADB has carried out a 10-year financial projection for PGCB, and estimated the wheeling charge trajectory for the projection period.

[37] This is the government's on-lending rate.
[38] Grant contribution is treated the same way as a capital subsidy. Therefore, it does not enter the WACC calculation.

Table A3.4: Projected wheeling charge in line with BERC's tariff methodology (2019-2029)

	2019	2020	2024	2029
Wheeling charge	0.3315	0.4010	0.7033	0.8903
Cost of service before ROE	0.1942	0.2349	0.3560	0.4374

18. **Outcome of the analysis.** Based on the above assumptions, in the base case scenario with WACC at 5.2 percent, the Project investment yield a financial net present value (FNPV) of US$729 million, and a financial internal rate of return (FIRR) of 10.1 percent, exceeding the WACC. Therefore, the project investment is financially viable. Critically, underpinning the financial viability of the project investment is the adoption of BERC's tariff methodology.

Table A3.5: Outcome of the financial analysis

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	...	2051
Incremental load and power supply														
Incremental - Component 1	*GWh*	-	-	-	-	-	14	1,304	2,400	2,633	3,173	3,742	7,662	7,662
Incremental - Component 1	*GWh*	-	-	-	-	-	28	98	214	415	784	1,300	4,432	4,432
Incremental - Component 1&2	*GWh*	-	-	-	-	-	42	1,402	2,614	3,048	3,956	5,042	12,094	12,094
Cash out flow														
Project investment in transmission	*million USD*	(41.1)	(109.5)	(205.4)	(239.6)	(89.0)	-	-	-	-	-	-	-	-
O&M cost - transmission	*million USD*	-	-	-	-	(15.4)	(15.9)	(16.3)	(16.8)	(17.3)	(17.9)	(18.4)	(34.2)	(35.3)
Sub-total	*million USD*	(41.1)	(109.5)	(205.4)	(239.6)	(104.4)	(15.9)	(16.3)	(16.8)	(17.3)	(17.9)	(18.4)	(34.2)	(35.3)
Cash in flow														
Revenue from wheeling charge	*million USD*	-	-	-	-	-	0.4	14.5	28.8	34.7	46.7	62.1	289.9	298.6
Sub-total	*million USD*	-	-	-	-	-	0.4	14.5	28.8	34.7	46.7	62.1	289.9	298.6
Net benefit	*million USD*	**(41.1)**	**(109.5)**	**(205.4)**	**(239.6)**	**(104.4)**	**(15.5)**	**(1.9)**	**11.9**	**17.4**	**28.8**	**43.7**	**255.7**	**263.3**

FNPV	*million USD*	**729**
FIRR	*%*	***10.1%***

19. **Sensitivity analysis**. Sensitivity study is carried out to assess the robustness of the financial viability of the Project. The analysis the economic viability of the project investment is highly robust to withstand large variations in key market and project-specific parameters, including (i) construction cost overruns; (ii) commercial operation day (COD) delays; (iii) additional power served; and (iv) worst case scenario which is a combination of all the above. The outcomes of the analysis indicate that the financial viability of the Project investment is robust against cost overruns and implementation delay. The outcomes of the analysis are summarized below.

Table A3.6: Sensitivity analysis – FIRR

	FIRR (%)	FNPV at 5.2% WACC
Base case	10.1%	US$729 million
[1] Investment cost +15%	8.9%	US$602 million
[2] COD 2 year delay	8.8%	US$560 million
[3] Additional power served -15%	8.8%	US$493 million
[1]+[2]+[3]	6.7%	US$223 million

III. Financial assessment of the implementing utilities

20. **Financial performance of PGCB.** Over the period FY2014-18, PGCB's

revenues from wheeling charge increased from BDT 7,673 million to BDT 15,351 million, at a cumulative annual average growth rate (CAGR) of 14.9 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 14.2 percent in FY2018. PGCB has gradually reduced the transmission losses from 2.9 percent to 2.6 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 the wheeling charge, coupled with lower capacity utilization of the transmission assets. By FY14, interest payables (mainly to the Government) accumulated to BDT 10 billion, nearly four times the interest expense of the year. The tariff was last increased by BDT 0.05 per kWh in September 2015, after almost a decade, increasing the return on net fixed assets to 6.0 percent for FY16.

Table A3.7: PGCB Financial performance (FY2013-18)

	Unit	2013	2014	2015	2016	2017	2018
Key financial figures							
Revenue - wheeling charge	Million BDT	7,673	8,465	9,133	12,524	14,168	15,351
Profit before tax	Million BDT	2,015	571	72	2,291	2,876	2,663
Profit after tax	Million BDT	1,010	29	416	1,226	1,996	2,180
Gross fixed asset	Million BDT	88,453	127,746	139,402	144,214	177,169	183,752
Current assets	million BDT	18,032	13,269	13,485	17,926	19,317	21,744
Current liabilities	million BDT	11,649	16,343	5,220	5,787	6,959	10,825
Paid in capital	million BDT	4,609	4,609	4,609	4,609	4,609	4,609
Ratios							
Profit margin	%	13.16	0.34	4.55	9.79	14.09	14.20
Return on average net fixed assets	%	8.74	4.96	3.20	6.27	5.97	5.20
Debt service coverage	Times	1.90	1.11	1.99	2.26	2.56	2.56
Debt/equity	Ratio	69/31	70/30	69/31	72/28	71/29	72/28
Account receivable to sales		1.55	0.81	2.58	3.10	2.78	2.49
Dividend per share	%	15	10	15	12	15	17
Earning per share	BDT	2.19	(0.06)	0.90	2.66	4.33	4.73
Transmission loss	%	2.92	2.82	2.80	2.86	2.67	2.60

21. **Tariff methodology and implementation.** Both the World Bank and ADB have carried out their separate reviews on BERC's tariff methodology and its implementation to date.

- **The World Bank** has identified the following risks and implications: (i) under such a scheme, only 8 percent of the US$12 billion ongoing and planned investments can be financed through internal cash generation, provided tariffs are adjusted in tandem; (ii) most of the PGCB's planned investments in the next five years will be funded through multilateral and bilateral sources. The tariff is

linked to electricity wheeled with no fixed capacity charges and exposes PGCB to risk from reduced power transmission between generation and the off-taking distribution companies; (iii) it may suffer financial losses if the power plants are delayed, or are not available, and/or if power cannot be transmitted because of constraints in the distribution network; (iv) the principal repayment is recovered through depreciation spreading over an average asset life of about 30 years, which does not correspond well with commercial financing, generally offered for much shorter maturities.

- Moreover, the rate base does not include work in progress, which incentivizes PGCB to complete and capitalize its projects as quickly as possible and start earning the return and recover its costs through depreciation. As work in progress gets capitalized, regular tariff applications by PGCB to BERC (not more than once annually according to the regulations) could ensure that its tariff remains cost-reflective; and it continues to fulfil its financial obligations and maintain its share of equity in the projects.

- **The ADB** has placed greater emphasis on the implementation of the tariff policy, especially on the timeliness of the tariff adjustment along with frequent and regular submission for tariff reviews, and ideally, an automatic adjustment mechanism for (i) inflation; (ii) efficiency improvement; (iii) additional capital expenditure incurred; and (iv) planned capital expenditure deferred.

Annex 4: 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 and the Rohingya refugee crisis. Bangladesh's risks of external debt distress and overall debt distress continue to be assessed as low. [39] The external debt to GDP ratio and public debt to GDP ratio remain well within the benchmark value for all standard stress tests.

[39] 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 5: Project Implementation Arrangement

A. Implementation Readiness Activities

Table A5.1: Expected Timelines

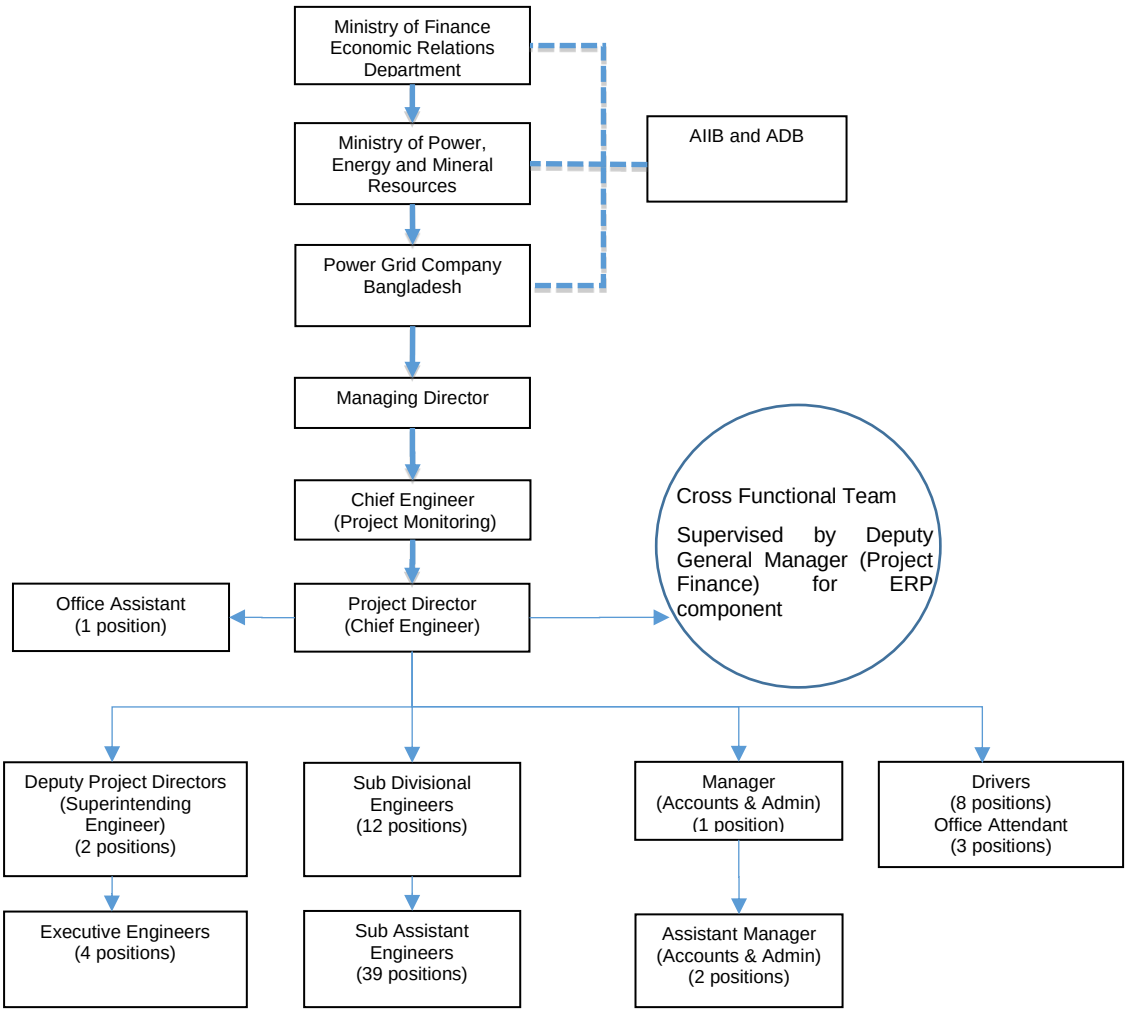
Indicative Activities	Months					Responsible Entities
	09. 2019	10. 2019	11. 2019	12. 2019	01-03. 2020	
Establishment of project implementation arrangements	X					PGCB
Government budget inclusion		X				GOB, PGCB
ADB Board approval			X			ADB
AIIB loan negotiation				X		GOB, PGCB and AIIB
AIIB loan approval					X	AIIB
AIIB loan signing					X	Bangladesh and AIIB

Bangladesh = People's Republic of Bangladesh; GOB = Government of Bangladesh; PGCB = Power grid Company of Bangladesh Limited.
Source: AIIB, ADB and PGCB estimate.

B. Project Management

1. **Implementation Entity**. PGCB will be responsible for overall project implementation and will set up a PMU to do the daily project implementation work after loan approval. 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. The Project organization structure is in Figure A5.1.

Figure A5.1: Project Organization Structure



Note: ERP component implementation will be supervised by a Deputy General Manger (Project Finance) with support from PGCB's Cross Functional Team which comprises 7 members.

ADB = Asian Development Bank, AIIB = Asian Infrastructure Investment Bank, ERP = Enterprise Resources Planning, PGCB = Power Grid Company of Bangladesh Limited., P&D = planning and design.

Source: PGCB.

2. **Oversight body**. The Steering Committee, which comprises high-level officials from Ministry of Power, Energy and Mineral Resources' 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. Composition of the steering commit and its terms of reference are as follows.

No.	Representatives	Position
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 Commission	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 of MoF	Member
12	Representative of ERD of MoF	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

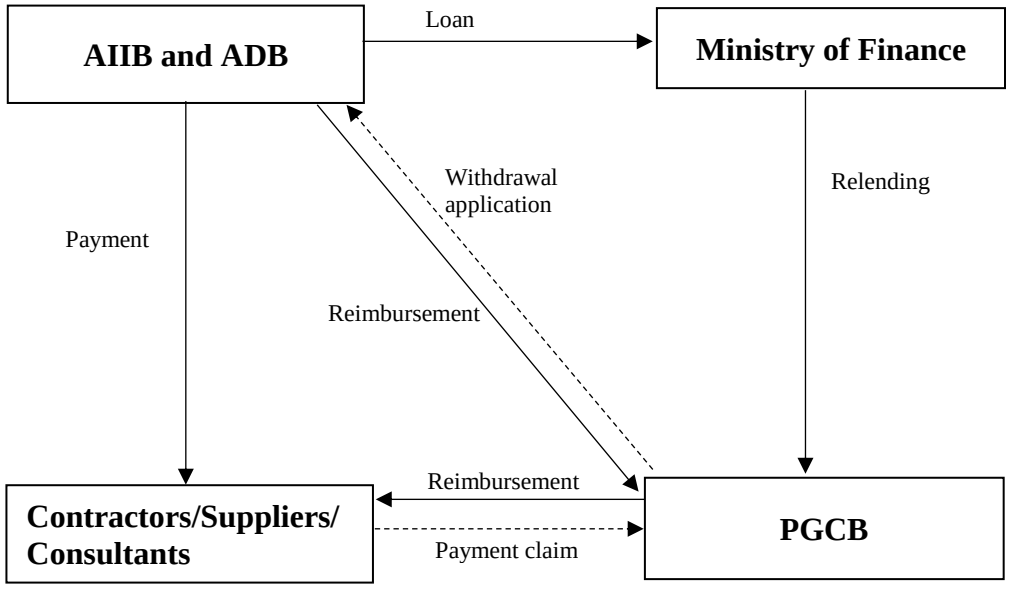
Terms of Reference:

- 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 are required for implementation of project activities.
- Any other matter related to project implementation.
- The committee will meet at least once in every three months.

C. Fund Flow Arrangement

3. The loan will be made to the People's Republic of Bangladesh, and the Government of Bangladesh will onlend the loan proceeds to PGCB through a subsidiary loan agreement under terms and conditions acceptable to AIIB. The Project will be divided into specific, identifiable contract packages, which will then be separately financed by AIIB and/or ADB.

4. The loan proceeds will be disbursed in accordance with the agreed arrangements between AIIB, ADB and PGCB. 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 Bangladesh should submit to ADB and AIIB 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.



Note: dotted line – document flow, hard line – fund flow

D. Allocation and Withdrawal of AIIB Loan Proceeds

Number	Item	Amount Allocated for AIIB Financing ($ million)	Percentage and Basis for Withdrawal from the Loan Account
1	Turnkey contracts (Packages 5, 7, 8)	188.78	100% of total expenditure claimed[a]
2	Unallocated contingency amount	7.19	100% of total expenditure claimed[a]
3	Interest and other charges under the loan	3.53	100% of amount due
4	Front-end Fee	0.50	Front loading
	Total	200.00	

[a] Exclusive of all duties and taxes imposed within the territory of the borrower.
Source: AIIB and ADB estimates.

E. Financial Management

5. **Accounting**. PGCB will maintain, or cause to be maintained, separate books and records by funding sources for all expenditures incurred under the Project following cash-based accounting system in accordance with International Public Sector Accounting Standards or their equivalent national accounting standards. PGCB will prepare project financial statements in accordance with the Government's accounting laws and regulations which are consistent with international accounting principles and practices.

6. **Auditing**. PGCB will cause the detailed project financial statements to be audited in accordance with the International Standards on Auditing as adopted by the Institute of Chartered Accountants of Bangladesh, by an independent auditor acceptable to ADB and AIIB or in accordance with the International Standards for Supreme Audit Institutions as issued by the International Organization of Supreme Audit Institutions.

7. The audit report for the project financial statements will include a management letter and auditor's opinions, which covers (i) whether the project financial statements present an accurate and fair view or are presented fairly, in all material respects, in accordance with the applicable financial reporting standards; (ii) whether the proceeds of the loan were used only for the purpose(s) of the Project; and (iii) whether the borrower or PGCB was in compliance with the financial covenants contained in the legal agreements (where applicable).

8. The audited project financial statements together with the auditor's opinion will be presented in the English language to ADB and AIIB within 6 months from the end of the fiscal year by PGCB. The audited entity financial statements, together with the auditor's report and management letter, will be submitted in the English language to ADB within 1 month after their approval by the relevant authority.

9. Compliance with financial reporting and auditing requirements will be monitored by review missions and during normal project supervision, and followed up regularly with all concerned, including the external auditor. The Government and PGCB have been made aware of ADB's approach to delayed submission, and the requirements for satisfactory and acceptable quality of the audited project financial statements.[40] ADB and AIIB reserve the right to require a change in the auditor (in a manner consistent with the constitution of the borrower), or for additional support to be provided to the auditor, if the audits required are not conducted satisfactorily, or if the audits are substantially delayed. ADB and AIIB reserve the right to verify the Project's

[40] ADB's approach and procedures regarding delayed submission of audited project financial statements:
(i) When audited project financial statements are not received by the due date, ADB will write to the executing agency advising that (a) the audit documents are overdue; and (b) if they are not received within the next 6 months, requests for new contract awards and disbursement such as new replenishment of advance accounts, processing of new reimbursement, and issuance of new commitment letters will not be processed.
(ii) When audited project financial statements are not received within 6 months after the due date, ADB will withhold processing of requests for new contract awards and disbursement such as new replenishment of advance accounts, processing of new reimbursement, and issuance of new commitment letters. ADB will (a) inform the executing agency of ADB's actions; and (b) advise that the loan may be suspended if the audit documents are not received within the next 6 months.
(iii) When audited project financial statements are not received within 12 months after the due date, ADB may suspend the loan.

financial accounts to confirm that the loan proceeds are used in accordance with the agreed policies and procedures.

F. PROCUREMENT

10. Procurement of goods works and non-consulting and consulting services will be undertaken in accordance with ADB's Procurement Regulations for ADB Borrowers: Goods, Works, Non-consulting and Consulting Services (2017, as amended from time to time).

11. **Advance Contracting and Retroactive Financing**. All advance contracting and retroactive financing will be undertaken in conformity with ADB's Procurement Policy (2017, as amended from time to time) and Procurement Regulations for ADB Borrowers: Goods, Works, Non-consulting and Consulting Services (2017, as amended from time to time). Universal procurement will be allowed. The issuance of invitations to bid under advance contracting and retroactive financing will be subject to ADB approval. The Borrower and PGCB have been advised that approval of advance contracting and retroactive financing does not commit ADB and AIIB to finance the project. Advance contracts can be entered into for goods, works and consulting services through (i) tendering, and bid evaluation for civil works packages; (ii) preparation of tender documents to procure materials and equipment; (iii) evaluation of bids; and (iv) recruitment of consultants. Retroactive financing. Retroactive financing is requested and will not exceed 20% of the loan amount, for expenditures incurred not earlier than 12 months before the signing of the loan agreement.

12. Open competitive bidding with international advertisement and national advertisement will be used. Shopping will be used for contracts for procurement of works and equipment worth less than $100,000.

13. **Procurement Plan**. An 18-month procurement plan indicating threshold and review procedures, goods, works, and consulting service contract packages and national competitive bidding guidelines is as follows. The procurement plan should be updated whenever change in the procurement arrangements is required and agreed.

Procurement Plan: Description of Packages

Package Number	General Description	Details	Estimated Value ($)
Package 1	400 kV & 230 kV transmission lines in Greater Dhaka	Kaliganj-Purbachal 400 kV double circuit line: 18 km (using Quad Finch Equivalent ACCC Conductor), LILO of Kaliakair-Bhulta 400 kV double circuit line at Kaliganj: 0.5 km four circuit line (using Quad Chukar Conductor), LILO of Tongi-Ghorasal 400 kV (charged at 230 kV) double circuit line at Kaliganj: 3.5 km four circuit line (using Quad Finch Conductor) & LILO of Tongi-Ghorasal 230 kV double circuit line at Kaliganj: 3.5 km four circuit line (using Mallard Equivalent ACCC)	29,552,000
Package 2	400 kV/230 kV/132 kV underground cable lines and 400 kV/230 kV transmission lines in Greater Dhaka	Purbachal 400 kV-Purbachal-2 230 kV double circuit underground cable line: 5 km (XLPE 2000 mm²), River Crossing portion of Purbachal 400 kV-Purbachal-2 double circuit line: 0.5 km (overhead 230 kV line Twin Mallard architecture), & Rampura-Basundhara 132 kV underground cable line: 9 km (XLPE 1200 mm²)	25,732,000
Package 3	230 kV & 132 kV transmission lines in western zone	Satkhira-Rupsha 230 kV double circuit line (initially charged at 132 kV): 62 km including 0.7 km river crossing line (using Twin Mallard equivalent ACCC Conductor), LILO of Rupsha Power Plant-Khulna (S) double circuit 230 kV line at Rupsha Substation: 0.5 km (using Twin Mallard equivalent ACCC Conductor), Satkhira-Manirampur 132 kV double circuit line: 33 km (using single Grosbeak equivalent ACCC), Kaliganj-Maheshpur 132 kV double circuit line: 28 km (using single Grosbeak equivalent ACCC), Kushtia-Meherpur 132 kV double circuit line: 48 km (using single Grosbeak equivalent ACCC), LILO of Goalpara-Bagerhat 132 kV double circuit line at Rupsha: 3.5 km (using Single Grosbeak), LILO of Gopalganj-Gallamari 132 kV double circuit line at Rupsha: 0.5 km (using Single Grosbeak), & LILO of Noapara-Khulna Central double circuit 132 kV line at Phultala: 1 km (using single Grosbeak equivalent ACCC)	59,027,000
Package 4	230 kV & 132 kV transmission lines in western zone (2)	Purbasadipur-Domar 230 kV double circuit transmission line: 46.5 km (using Twin Mallard equivalent ACCC Conductor), Gopalganj (N)-Shibchar 230 kV double circuit line (initially charged at 132 kV): 25 km including 0.4 km river crossing line (using Twin Mallard equivalent ACCC Conductor), LILO of Barishal-Bhola-Borhanuddin double circuit 230 kV line at Bhola substation : 1 km (using Twin Mallard Conductor), Niamatpur-Patnitola 132 kV double circuit line: 32.5 km (using Grosbeak equivalent ACCC), Domar-Hatibandha 132 kV double circuit line: 35 km including 850 m Teesta River Crossing (using Single Grosbeak equivalent ACCC), Bagerhat-Pirojpur-Bhandaria 132 kV double circuit line: 49.5 km including 1.0 km Katcha River Crossing & 300 m Bhairab River Crossing (using Single Grosbeak equivalent ACCC), LILO of Madaripur-Faridpur 132 kV double circuit line to Bhanga: 0.5 km (Hawk equivalent ACCC), & LILO of Barishal-Bhandaria double circuit 132 kV line to Jhalokhati: 1.5 km (using Single ACSR Grosbeak)	68,550,000
Package 5	400/230 kV GIS substation in Greater Dhaka (2)	400/230 kV GIS Substation: Kaliganj (Gazipur) with 2×750 MVA 400/230 kV transformer (Future 132 kV Provision)	67,643,000
Package 6	400/230 kV and 230/132 kV GIS substations in Greater Dhaka (1)	400/230 kV GIS Substation: Purbachal with 3×750 MVA 400/230 kV transformer, & 230/132 kV GIS Substation: Purbachal-2 with 2×350/450 MVA 230/132 kV transformer.	73,394,000

Package Number	General Description	Details	Estimated Value ($)
Package 7	230/132/33 kV indoor GIS substation, 132/33 kV indoor GIS substations, and 132 kV AIS bay extensions in western zone (1)	230/132/33 kV Indoor GIS Substation: Rupsha with 3x250/350 MVA 230/132 kV and 3x80/120 MVA 132/33 kV transformer, 132/33 kV Indoor GIS Substation: Phultala with 3x80/120 MVA 132/33 kV transformer, 132/33 kV Indoor GIS Substation: Manirampur with 2x80/120 MVA 132/33 kV transformer, 132/33 kV Indoor GIS Substation: Maheshpur with 2x80/120 MVA 132/33 kV transformer, 132/33 kV Indoor GIS Substation: Meherpur with 2x80/120 MVA 132/33 kV transformer, Four 132 kV AIS Bay Extensions at Satkhira Substation, Two 132 kV AIS Bay Extensions at Kaliganj Substation, Two 132 kV AIS Bay Extensions at Bagerhat Substation & Two 132 kV AIS Bay Extensions at Kushtia Substation	58,875,000
Package 8	230/33 kV indoor GIS substation, 132/33 kV indoor GIS substations, and 132 kV AIS/outdoor GIS bay extensions in western zone (2)	230/33 kV Indoor GIS Substation: Bhola with 2x120/140 MVA 230/33 kV transformer (Future 132 kV Provision), 132/33 kV Indoor GIS Substation: Domar with 2x80/120 MVA 132/33 kV transformer (Future 230 kV Provision), 132/33 kV Indoor GIS Substation: Hatibandha with 2x80/120 MVA 132/33 kV transformer, 132/33 kV Indoor GIS Substation: Shibchar with 3x80/120 MVA 132/33 kV transformer (Future 230 kV Provision), 132/33 kV Indoor GIS Substation: Bhanga with 3x80/120 MVA 132/33 kV transformer, 132/33 kV Indoor GIS Substation: Jhalokhati with 2x80/120 MVA 132/33 kV transformer, 132/33 kV Indoor GIS Substation: Pirojpur with 2x80/120 MVA 132/33 kV transformer, Two 132 kV AIS Bay Extensions at Patnitola Substation, Two 132 kV AIS Bay Extensions at Niamatpur Substation, Two 132 kV AIS Bay Extensions at Gopalganj Substation, Two 132 kV Outdoor GIS Bay Extensions at Purbasadipur Substation & Two 132 kV Outdoor GIS Bay Extensions at Bhandaria Substation	62,249,000
Package 9	Supply, installation and related services for ERP system		8,000,000
Package 10	Drone Operations Platform		620,000
Package C1	Consultancy for ERP System Design and Implementation		640,000
Package C2	Consultancy for external monitor		40,000
Package C3	Consultancy for Drone Legislation		48,000

ACCC = aluminum conductor composite core, AIS = air insulated switchgear, D/C = double circuit, ERP = enterprise resource planning, GIS = gas insulated switchgear, kV = kilovolt, LILO = line-in line-out, MVA = megavolt ampere

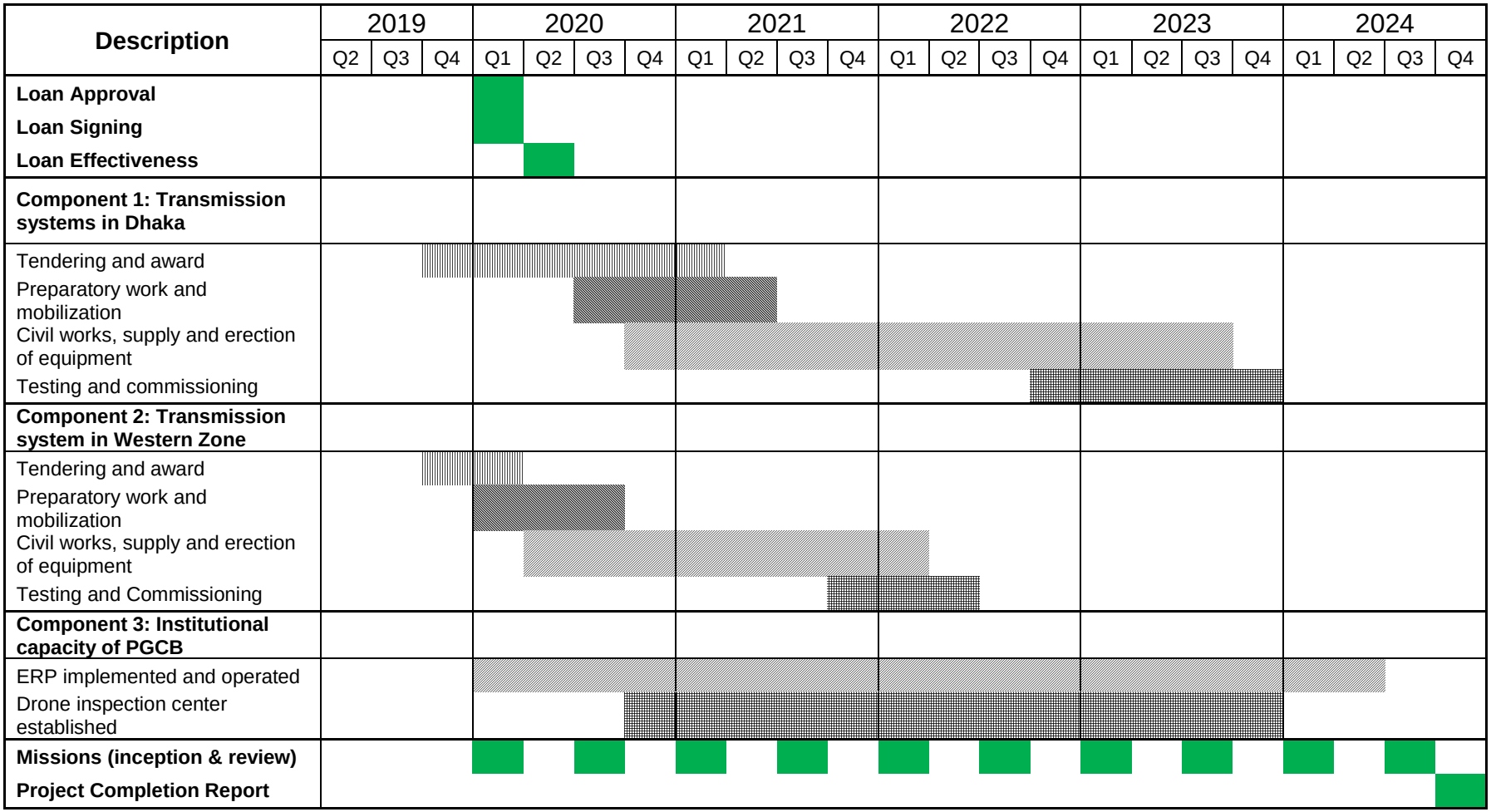
Procurement Plan: List of AIIB financed Packages

Goods and Works							
Package Number	**General Description**	**Estimated Value ($)**	**Procurement Method**	**Review**	**Bidding Procedure**	**Contract Award Date Expected**	**Comments**
Package 5	400/230 kV GIS substation (2)	67,643,000	OCB	Prior	1S2E	Q3/2020	Prequalification of Bidders: No Domestic Preference: Yes Advance Contracting: No Bidding Document: Plant
Package 7	230/132/33 kV indoor GIS substation and 132 kV AIS bay extensions (1)	58,875,000	OCB	Prior	1S2E	Q3/2020	Prequalification of Bidders: No Domestic Preference: Yes Advance Contracting: No Bidding Document: Plant
Package 8	230/132/33 kV indoor GIS substation and 132 kV AIS bay extensions (2)	62,249,000	OCB	Prior	1S2E	Q3/2020	Prequalification of Bidders: No Domestic Preference: Yes Advance Contracting: No Bidding Document: Plant

Note: OCB = open competitive bidding, 1S2E = 1-stage-two-envelop

Sources: AIIB, ADB and PGCB estimates.

G. Overall Project Implementation Schedule



Note: Q1 = quarter one
Sources: AIIB, ADB and PGCB estimates.

H. Project Monitoring

14. Overall monitoring of the Project in terms of progress will be undertaken by the Government of Bangladesh, which will review monthly progress reports submitted by PGCB. The projects department of PGCB will monitor progress, procurement, quality, contract management, and fiduciary management. In addition, the projects department will undertake regular field visits and provide guidance to the project director and the project consultants.

15. **Compliance monitoring**. Loan covenants, such as legal, financial, economic, environmental, and others, will be monitored through the quarterly progress reports and review missions.

16. **Safeguards monitoring**. PGCB must adhere to the IEE, EMPs and RP during contract implementation as prepared in accordance with ADB's Safeguard Policy Statement (2009) and as agreed by Bangladesh. PGCB will provide environmental monitoring reports to ADB and AIIB on a regular basis during construction until the Loan Closing Date and submit separate social monitoring reports to ADB and AIIB on a semiannual basis. The environmental and social monitoring reports will describe implementation progress of environment and resettlement activities and compliance issues and include quantitative monitoring data in accordance with the IEE/EMPs, environmental monitoring plans and RP, respectively. In the event of any unanticipated environmental or resettlement impacts during implementation, or if monitoring identifies a breach of performance standards that should be complied with by PGCB and/or their contractors, PGCB will submit to ADB an updated IEE/RP in the former case, and implement a time-bound corrective action plan in the latter case.

I. Project Review Mission

17. ADB will field regular review missions every six months at the minimum to review status of contract awards, disbursements, physical progress, and implementation of the environmental management plan and RP. As necessary, special loan administration missions and midterm review missions will be fielded, under which any changes in scope or implementation arrangements may be required to ensure achievement of project objectives. Within 6 months following physical completion of the project, PGCB will submit a project completion report to ADB.[41] Subsequently, ADB will field a mission to finalize the project completion report. Following table explains the purpose and methodology to be used in the project review mission. AIIB staff will join these missions as often as feasible, but will in any event conduct its own site visits not less than annually.

Mission	Purpose	Methodology	Responsibility
Review Mission	Review the progress of the project and provide guidance to facilitate implementation	Site visits and meetings with PGCB officials, contractors, consultants at least twice a year	ADB and PGCB (AIIB staff to join as feasible)
Midterm Review	Comprehensive review of the project	With GOB and PGCB after 2 years of effectiveness	ADB and PGCB
Project completion report	Evaluate the overall output of the project and its relevance and suitability	Site visit and meetings with PGCB officials, contractors, consultants	ADB and PGCB

ADB = Asian Development Bank, GOB = Government of Bangladesh, PGCB = Power Grid Company of

[41] Project completion report format is available at: http://www.adb.org/Consulting/consultants-toolkits/PCR-Public-Sector-Landscape.rar

Bangladesh Limited.
Source: ADB and PGCB.

J. Reporting

18. PGCB will provide ADB and AIIB with: (i) quarterly progress reports in a format consistent with ADB's project performance reporting system; (ii) consolidated annual reports, including, (a) progress achieved by output as measured through the performance indicators, (b) key implementation issues and solutions, (c) updated procurement plan, and (d) updated implementation plan for the next 12 months; and (iii) a project completion report within 6 months following physical completion of the Project.