



The World Bank

Transmission Grid Enhancement & Modernization Project (P179429)

Project Information Document (PID)

Concept Stage | Date Prepared/Updated: 17-Oct-2022 | Report No: PIDC34676



BASIC INFORMATION

A. Basic Project Data

Country Bangladesh	Project ID P179429	Parent Project ID (if any)	Project Name Transmission Grid Enhancement & Modernization Project (P179429)
Region SOUTH ASIA	Estimated Appraisal Date Nov 24, 2023	Estimated Board Date Mar 29, 2024	Practice Area (Lead) Energy & Extractives
Financing Instrument Investment Project Financing	Borrower(s) People's Republic of Bangladesh	Implementing Agency Power Grid Company of Bangladesh	

Proposed Development Objective(s)

The project aims to enhance transmission capacity and reliability of the grid network, improve efficiency in grid operations and maintenance, and enable regional integration and evacuation of renewable energy generation.

PROJECT FINANCING DATA (US\$, Millions)

SUMMARY

Total Project Cost	680.00
Total Financing	680.00
of which IBRD/IDA	450.00
Financing Gap	0.00

DETAILS

World Bank Group Financing

International Development Association (IDA)	450.00
IDA Credit	450.00

Non-World Bank Group Financing

Counterpart Funding	230.00
Borrower/Recipient	230.00



Environmental and Social Risk Classification

High

Concept Review Decision

Track II-The review did authorize the preparation to continue

Other Decision (as needed)

B. Introduction and Context

Country Context

1. **Bangladesh has made rapid social and economic progress in recent decades and reached lower middle-income status in 2015.** Annual GDP growth averaged close to six percent since 2000. Strong labor market gains contributed to a sharp decline in poverty, with the national poverty rate falling from 48.9 to 24.5 percent between 2000 and 2016, while extreme poverty declined from 34.3 to 13.0 percent.¹ However, the pace of poverty reduction slowed in recent years even as growth accelerated, particularly in urban areas and in the west of the country. Annual consumption growth of the bottom 40 percent (1.2 percent) trailed that of the overall population (1.6 percent) from 2010 to 2016.
2. **While growth rebounded in FY21 and FY22, significant new headwinds emerged.** Real GDP growth rebounded as pandemic-related restrictions were progressively lifted in FY21, accelerating to an estimated 7.2 percent in FY22 as private consumption and investment growth strengthened. Exports rose by 31.3 percent (y-o-y), buoyed by a gain in readymade garment (RMG) market share in Europe and the United States. However, the economy faces new headwinds. Inflation rose to 7.5 percent in as of July 2022 from 5.3 percent a year ago following a global surge in commodity prices, prompting the BB to raise the main policy rate by 100 basis points. The current account deficit widened as imports rose, exacerbated by a decline in official remittances inflows. A series of import suppression measures were subsequently adopted, including rolling electricity blackouts, reductions in liquified natural gas (LNG) imports, and reduced business and market hours. The overall balance of payments deficit rose to US\$ 5.4 billion in FY22, and gross foreign exchange reserves declined to US\$ 36.5 billion by September 2022.
3. **Bangladesh faces a high level of vulnerability to the effects of climate change.** The Global Climate Risk Index ranks Bangladesh as the world's seventh most-affected country in 2000-2019². Rising temperatures leading to more intense and unpredictable rainfalls during the monsoon season and the already high probability of catastrophic cyclones are expected to further increase resulting in increased tidal inundation. Flooding in Bangladesh is a near-constant phenomenon, recurring with varying magnitude and intensity, affecting a greater population than any other natural hazard. Floods and riverbank erosion in Bangladesh affect about one million people annually and can be substantially higher³. Once every three to five years, up to two-thirds of Bangladesh is inundated by floods.⁴

¹ Household Income and Expenditure Surveys, 2000/01 and 2016/17.

² German watch (2021) Global Climate Risk Index 2021.

³ World Bank: Climate Change Knowledge Portal.

⁴ The World Bank: Climate Risk and Adaptation Country Profile (Bangladesh)



Addressing these climate risks will support sustainable economic development, ensuring that the vulnerable populations are not left behind.

Sectoral and Institutional Context

4. Institutionally, the Ministry of Power, Energy and Mineral Resource (MPEMR) in Bangladesh has the responsibility for the power sector. The vertically integrated Bangladesh Power Development Board (BPDB) under the MPEMR has been partially unbundled, starting in 1978. In 1994, the Government launched a power sector reform program under which the Power Grid Company of Bangladesh (PGCB) was created as the transmission entity, which also includes the National Load Dispatch Center, along with separate distribution and generation companies. Currently, 51 percent of total grid-connected power is generated by public sector plants operated by BPDB, other corporatized generation companies and a joint venture, 44 percent by private sector, and the remaining 5 percent through power import.

5. In the last decade, the Government's prioritization of generation and electrification has allowed Bangladesh to make impressive progress in increasing access to electricity and power generation capacity, an achievement which must now be followed by investments in the reliability of electricity supply. Total installed generation capacity has increased from 6GW in 2010 to 22.5 GW in 2022 and in the same period, the average peak demand increased from 6GW to the current average peak demand of 12 GW in the country. Annual per capita electricity consumption (which was one of the lowest in the world in 2010) has also more than tripled to 608 Kilowatt hours (Kwh) in 2022. Due to this rapid growth of system demand, a considerable number of grid substations and transmission lines are presently overloaded contributing to unreliable electricity supply in major load centers. This poses a major challenge for the expansion of medium-size enterprises with export potential. As significant industrialization is expected to take place after completion of some of the major infrastructure projects in the country, a steeper increase in power demand is anticipated.⁵ In addition, the increasing vulnerability of Bangladesh to climate change and natural hazards renders investments in climate resilient power infrastructure a central condition of safe, affordable and reliable electricity. To meet this future demand and ensure quality and uninterrupted electricity supply, the expansion of a climate resilient transmission network is mandatory⁶.

6. As electricity supply in Bangladesh is still heavily reliant on fossil fuels, targeted grid expansion efforts are required to increase Variable Renewable Energy (VRE) penetration and to facilitate electricity trade with hydro-rich countries. In 2021, only 2% (0.5 GW) emanated from Variable Renewable Energy (VRE). However, only about 0.14 GW of VRE was grid installed with a dispatchable capacity of 0.1 GW due to grid constraints⁷. If Bangladesh is to meet its 15% generation target of electricity from renewable energy sources (RES) by 2041⁸ and make progress towards decarbonizing its energy system, it must invest in grid expansion schemes to provide the required evacuation corridor for the potential 6GW of VRE under the Business-as-Usual scenario by 2041. In addition, as Bangladesh plans to import about 11GW of electricity from the Bangladesh-Bhutan-India-Nepal-Sri Lanka (BBINS) region by 2041, building multiple corridors is being considered for electricity imports through cross-border interconnections. The Northern part of

⁶ This is particularly the case for the Project area as explained in section Project Context – A. Concept – 1. Description.

⁷ Grid reliability study for integration of renewable energy into the national grid of Bangladesh (September 2021), Power Division, GoB

⁸ According to its Power System Master Plan (PSMP2016).



Bangladesh is predominantly the expected area of regional interconnectivity to enable Bangladesh to benefit from power trade⁹ with hydro-rich countries like Nepal and Bhutan.

7. Bangladesh's transmission system mainly consists of 400 kilo-Volt (kV), 230 kV and 132kV systems; one 400kV Back-to-Back HVDC system has been implemented, through which 1,160 megawatt (MW) power is being imported from India every day. The country has about 13,889 circuit km of transmission lines and about 73,484 GWh of power was wheeled through the transmission network during the FY 2020-21. Transmission loss of the network has come down to 3.05 percent in 2020-21 from 4.24 percent in 2000-01. The country is vertically divided by the rivers Jamuna and Padma. The Western and Eastern part of Bangladeshi network is interconnected by two 230kV double circuit lines.

8. PGCB, the sole authority of the transmission network in the country, undertook several development projects to improve the network condition. To achieve the Government of Bangladesh (GoB) target of increasing power generation to 40 giga-watt (GW) by 2030, further investment of about USD2.5 billion in enhancing and strengthening the network is currently under consideration. The Eighth (8th) Five Year Plan (2020-2025) of the government clearly prioritized the importance of developing transmission network to achieve the real benefits of the generation expansion program through further development of transmission infrastructures which is also expected to reduce transmission and distribution losses. The proposed project is a step towards achieving that target and will address the need for network improvement in the important commercial routes in the Central, Southern and Northern Regions of the country.

Relationship to CPF

9. The proposed operation is aligned with the draft World Bank Group's (WBG) Bangladesh Country Partnership Framework (CPF) 2023-2027 by making investments in key infrastructures that would directly supports the CPF's objective of increased sustainable and productive use of natural capital to facilitate green growth and energy transition. More specifically this operations seeks to contribute to addressing objective 9, in the Bangladesh CPF outcomes through the following pathways: a sustainable development pathway that is resilient to disasters and climate change by enabling more renewable energy penetration into the energy mix, the improvement of delivery of electricity services by strengthening power transmission infrastructure and improve grid reliability for better supply-demand linkage, which is expected to facilitate higher levels of economic activity and poverty reduction in rural areas. Finally, the proposed operation will also support the CPF objective 9 of regional power interconnectivity through the development of regional power interconnection hub with India that would have the capacity to evacuate potential hydro power from neighboring countries such as India, Bhutan and Nepal, which would create opportunities to facilitate the implementation of a regional power pool.

C. Proposed Development Objective(s)

10. The project aims to enhance transmission capacity and reliability of the grid network, improve efficiency in grid operations and maintenance, and enable regional integration and evacuation of renewable energy generation.

Key Results (From PCN)

11. The PDO-level results indicators are:

- a. Increase in transformation capacity (Megavolt Ampere or MVA)
- b. Reduction of the number of forced outages per substation per year (Percent)

⁹ Bangladesh has the potential to benefit about USD1.3 billion per annum (pa) from a flow of electricity from the region of about 16.7 TWh pa.



- c. Grid integration enabled for large-scale renewable energy (Megawatt)
- d. Improvement in operations and maintenance practices (Yes/No)
- e. People provided with new or improved electricity services (Number)

12. Intermediate indicators are:

- a. Transmission lines constructed (ckm)
- b. Number of new substations installed or upgraded (Number)
- c. Geographical Information system (GIS) infrastructure developed (Yes/No)
- d. Emergency Restoration System (ERS) procured (Yes/No)
- e. Power System protection software procured and deployed (Yes/No)
- f. Increase in number of female staff hired in technical roles (Percent)

D. Concept Description

13. The proposed project is the continuation of Bank's support to PGCB in improving reliability of the transmission network, facilitating regional import and integrating renewable energy into the national grid. The project will involve construction of 3 new 400kV and 5 new 230kV substations with a total capacity of 17,400MVA. The project will also capture the upgradation of 4 existing substations, construction of 274ct-km of 400kV of new transmission lines and 95ct-km of 230kV transmission lines. The activities under the project are largely distributed across the Southern, Central and Northern Regions of the country. With the added lines and substations, the system will be able to respond to the increasing electricity demand, improve reliability and support economic growth in the project areas. It will help provide evacuation corridor for new generation plants (including renewable energy-based generation) – expected to be financed mostly by the private sector – by removing transmission bottlenecks and enabling better access to the end-use market. The project will also facilitate regional power import, enhance grid resilience and introduce grid digitization.

14. The proposed USD680 million (IDA USD450 million) operation is comprised of the following main components:

Component 1– Enhancement and modernization of Transmission system (IDA USD435 million): This component will involve building transmission network infrastructures in central, southern and northern regions of the country and improve efficiency in grid operations and maintenance.

Sub-component 1 – Grid enhancement for improving reliability in central region (IDA USD330 million): This sub-component will cover the construction and upgradation of the required transmission lines and substations to establish 400kV ring network for Dhaka region and improve system reliability. Electricity demand in this area is significantly increasing due to the growing development activities. Currently about 35 to 40 percent of generated electricity is consumed in Dhaka city and electricity demand of this area is forecasted to be tripled by 2041 (PSMP-2016). The activities under this component are to (i) construct three (3) new 400 kV high-capacity transmission rings, one (1) new 400/230/132kV substation and four (4) new 230/132 kV substations; and (ii) upgrade four (4) existing 230/132 kV substations.

Sub-component 2 – Grid enhancement for enabling renewable energy integration in the southern region (IDA USD68 million): This sub-component will address the future demand of the southern region and ensure transmission facilities for evacuation of renewable energy generation in that area. Demand of electricity in Barisal and Patuakhali will go up as significant industrialization is expected to take place in that area after completion of some of the major infrastructure projects namely the Padma Multipurpose Bridge project and Payra Port. The



activities under this component are to construct one (1) new 400/230/132 kV substation and one (1) new 230/132kV substation.

Sub-component 3 – Grid Enhancement for Enabling Renewable Energy Integration and Facilitation of Regional Import in Northern Region (IDA USD22 million):

This sub-component will build one (1) new 400/230 kV substation at Parbatipur to facilitate regional power interconnection with India in the future to transport power from/to neighboring countries like Bhutan and Nepal through the Indian grid. This 400kV substation is planned to be a key hub to facilitate grid connected RE integration to the rest of the grid from the Northern region power corridor. Furthermore, since there is no 400kV substation in that part of the country, the introduction of Parbatipur 400kV substation would help in improving the voltage profile in the Northern part allowing better quality of power flow to and from Dhaka and other areas, where the loads are concentrated.

Sub-component 4: Grid Modernization and Digitization (IDA USD15 million): This component will have provisions for the following activities that is expected to improve the efficiency of operations and maintenance practices of the implementing agency. The proposed activities are:

- i. Installation of Emergency Restoration System (ERS) for 400 kV voltage levels in selected project areas to reduce downtime in restoring damaged towers due to natural disasters and improve grid resilience.
 - ii. Procurement of (a) Protection Coordination Software to improve operations of PGCB and (b) additional live line maintenance tools which are critical equipment to restore line outages at minimal outage duration without shutting down the entire circuits.
 - iii. Deployment of Geographical Information System (GIS) infrastructure to inculcate best practice to enhance system planning and operational activities within PGCB. This is also intended to tie into an integrated planning system across the generation, transmission and distribution sectors in Bangladesh.
15. In addition to these proposed works above, and subject to the satisfactory assessment by the implementing agency, Component 1 could cover a broader scope aimed at decarbonizing the grid by addressing key constraints to the optimal dispatch of the current grid connected VRE capacity ($135 \text{ MW} \approx 0.14\text{GW}$).

Component 2 (USD15 million) – Institutional support, capacity development and project implementation.

16. **The World Bank plans to enhance its long-term engagement with PGCB through additional support and technical assistance.** Component 2 would therefore cover several aspects, some of which will be further discussed during project preparation:

- i. Provision for capacity development and training for PGCB officials in the areas of power system investment planning, system analysis and operations as well as environment and social compliance.
- ii. Reactive Power Management (RPM) study and implementation, which will be carried out in two phases. Phase 1 would cover the RPM study of Bangladesh grid and determine the optimal grid location of the Static Var Compensators (SVC) and the implementation of the outcome of the studies would be covered in phase 2.
- iii. Credit Rating assessment of PGCB and the development of a financial model for PGCB to understand their investment needs and the cost of borrowing and of financing from different sources to help them decide on the alternate market-based borrowing options.
- iv. Integration of PGCB's Maintenance Management Systems and Fixed Asset register works currently being undertaken in an on-going project.
- v. Support the implementing agency (PGCB) in project implementation through hiring of dedicated consultants (implementation support, independent procurement, etc.)



Legal Operational Policies	Triggered?
Projects on International Waterways OP 7.50	No
Projects in Disputed Areas OP 7.60	No

Summary of Screening of Environmental and Social Risks and Impacts

The total estimated land requirement for all eight (three 400kV and five 230kV) sub-stations is expected to be within 60 acres. The Project will try to use government land (if available) or vacant private land (fallow or one-crop lands are usually used) may be acquired, which will cause loss of land for owners and may cause temporary impacts on owners, tenants and/or sharecroppers due to loss of crops and trees. No physical displacement is expected.

Most of the expected impacts are likely to occur during the construction phases, mainly: generation of solid waste, air pollution and noise, disruption of traffic, etc. The TL construction may also cause disturbance of ROW soils and vegetation through the movement of people and vehicles along the ROW and access roads.

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APPROVAL

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