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Combined Project Information Documents / Integrated Safeguards Datasheet (PID/ISDS)

Appraisal Stage | Date Prepared/Updated: 01-Mar-2017 | Report No: PIDISDSA21457



BASIC INFORMATION

A. Basic Project Data

Country Bangladesh	Project ID P159807	Project Name Power System Reliability and Efficiency Improvement Project	Parent Project ID (if any)
Region SOUTH ASIA	Estimated Appraisal Date 27-Dec-2016	Estimated Board Date 26-Apr-2017	Practice Area (Lead) Energy & Extractives
Lending Instrument Investment Project Financing	Borrower(s) Peoples Republic of Bangladesh	Implementing Agency Power Grid Company of Bangladesh (PGCB) Ltd.	

Proposed Development Objective(s)

Improve the reliability and efficiency of the power system in Bangladesh through optimization of dispatch operation.

Components

- Technical Assistance
- Operational Enhancements
- Removal of Transmission Bottlenecks and Improvement of Voltage Quality
- Total

Financing (in USD Million)

Financing Source	Amount
Borrowing Agency	6.00
Borrower	12.00
International Development Association (IDA)	59.00
Total Project Cost	77.00

Environmental Assessment Category

B - Partial Assessment

Decision

The review did authorize the preparation to continue



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Other Decision (as needed)

B. Introduction and Context

Country Context

Bangladesh's economy has performed well over the past decade despite the adverse impacts of the global recession, oil price rise, unrest in the Middle East that constrained remittance inflow, and natural disasters. The GDP growth has risen from an average of 3.7 percent per annum in the 1980s to over 6 percent since 2010. This growth rate has been dependent largely on a reliable and affordable supply of electricity. Bangladesh has moved up to lower-middle income status in Fiscal Year (FY) 14 from low income group. The national poverty rate fell from 44.2 percent in 1991-92 to 18.5 percent in 2010 and to 14.4 percent in 2016¹.

However, the recent sustained growth has widened infrastructure deficits in the electricity and other sectors. The supply of power has not been able to keep pace with the rapid growth of electricity demand. Mismatch in supply and demand results in variation of system frequency and frequent outages/load shedding are observed. Power plants are not dispatched on merit order (increasing order of costs) that results in fuel wastage which keeps the system cost high. The electricity capacity shortfall of 1,000 MW or more coupled with vulnerable grid network, culminated in a nationwide black-out in November 2014. The constraint in terms of access to electricity and quality of service is also affecting households and translates in a 407 kWh/year electricity consumption per capita, one of the lowest in the world and lower than most of the South Asian countries. About 78 percent of the population has access to electricity with almost full coverage in urban areas but only 70 percent in rural areas.

Sectoral and Institutional Context

Over the last 20 years, Bangladesh has implemented an ambitious power sector reform program to improve sector performance and create an enabling environment to attract private and public investment in the sectoral development. The country made substantial progress but still needs to tackle major challenges linked to (i) finalization of the institutional reforms to ensure technical and financial sustainability of the power sector, (ii) timely financing and implementation of the investment needed to meet the increasing demand for electricity and reach universal access and, (iii) improvement of the operational performance and quality of service of electricity.

The sector has grown rapidly over the last decade. The peak demand increased from 4.5 giga-Watt (GW) in 2010 to more than 9 GW in 2016 and there is significant suppressed demand. At the same time, the installed generation capacity doubled over 5 years to reach 11.8 GW in 2016. However, only 8.5-9 GW is available at the maximum and a 1,000 MW of load shedding on average is observed, in particular during summer. Electricity demand is projected to grow by more than 10 percent per annum over the medium term. To address the gap, the Government's plan is to double the-2016 installed generation capacity by 2021 and reach 50 GW by 2041

¹ Based on Bangladesh Development Update, October 2016, World Bank. The first two poverty rates are based on survey data and the third one on "projected actuals".



using private and public resources. The Government is also working on the optimal energy mix including power imports, taking into account the depleting natural gas reserves.

Expansion of the transmission network and improvement of its operations are also needed to accommodate the increase of power flows and maintain a demand-supply balance. The rapid increase of the power system size amplifies the challenge to ensure the quality and reliability of electricity supply. Three major issues should be addressed as soon as possible to enable PGCB operate the system with efficiency and reliability. They are related to (i) frequency control, (i) voltage fluctuation and (iii) merit order dispatch. The project envisages to address these issues to improve the quality of supply.

C. Proposed Development Objective(s)

Note to Task Teams: The PDO has been pre-populated from the datasheet for the first time for your convenience. Please keep it up to date whenever it is changed in the datasheet.

Development Objective(s) (From PAD)

Improve the reliability and efficiency of the power system in Bangladesh through optimization of dispatch operation.

Key Results

- ✓ Reduction in interruptions and outages of power supply. (Numbers; Cumulative duration);
- ✓ Fuel savings from load reduction of oil-fired generators being used to support system frequency; and
- ✓ Adherence to merit-order dispatch (Quantity of fuel saved).

D. Project Description

Bangladesh has a small but weak power system. The national load dispatch center (NLDC) is responsible for system operation. The system is reliant on manual dispatch and controls that are detrimental to economics and system security. The supervisory control and data acquisition (SCADA) system of the NLDC in Dhaka is not integrated with the power plants and is unable to send/receive signals for changing the generation outputs; nor does it receive real time demand forecasts from the distribution companies. The NLDC has to manage the dispatch using guesswork and through instructions to generators over the phone.

There is also demand- supply imbalance (and no spinning reserve) that creates wide variations in frequency and voltage which are reasons for frequent power outages and load shedding. To prevent the failures, the system frequency need to be managed within a narrow band from the norm (50 Hz in Bangladesh) by adjusting supply (generation) and or demand (load shedding) as needed, to bring them to balance. The dispatch of power from NLDC is not also consistent with the principle of merit order. Under this concept, power plants are usually dispatched in the increasing order of cost.

PGCB, BPDB (Bangladesh Power Development Board) and other stakeholders have undertaken few primary frequency control trials and training to address the wide frequency variations. From results of these trials and dispatch studies carried out by international consultants, Bank staff and PGCB, it is concluded that retrofitting of an automated, modernized dispatch function with associated investments in transmission upgrading would ultimately (i) improve the system security and reliability (minimizing outages and preventing wider blackouts on a sudden disturbance in network); and, (ii) increase the efficiency or cost effectiveness of system operation. The project is conceived as the first stage of a process of modernization of system dispatch in Bangladesh,



recognizing that this is a long process that can best be implemented in phases. The project has three components covering i) technical assistance and capacity building; ii) investment in immediate operational enhancements; and, iii) investment in transmission upgrades to address bottlenecks in high priority lines.

Component 1: Technical Assistance (TA) (US\$6 million funded by IDA)

(i) Sub-component 1.1: Primary Frequency Control Trials and Training (US\$ 3 million): This will support primary frequency control trials and training for PGCB/NLDC engineers/operators on modern, state-of-the-art frequency control and dispatch protocols. This will include expert assessment of conditions of participating power stations, transmission network, and NLDC (energy management system.

EMS/SCADA and Dispatch) for identification of hardware and software to be procured to ensure effective implementation of primary and secondary controls and integration of generators with NLDC. Power plants will be prioritized for frequency control purposes and a dispatch order will be set up. This will take place over a period of six months and will require a team of experts including offsite power system modelers; and

(ii) Sub-component 1.2: Capacity Building and Institutional Review (US\$3 million). This will support a capacity building and institutional review to (i) acquaint NLDC staff with modern control theory, practical aspects of regulating frequency in real-time through governor response as well as secondary control, and (ii) build power system dynamic modeling capability using PSSE (power system **) tool. This will also include an in-depth review of the institutional and policy barriers that have limited NLDC's control over generators and resulted in the lack of merit order dispatch. The review is expected to identify the critical path for implementing the merit order dispatch and making recommendations for transitioning to automatic generator control (AGC) and a fully modernized dispatch system over time, which the Bank could potentially support through a follow-up operation. Finally, it will build awareness and capacity on the basics of system dispatch through training to be provided to stakeholders beyond PGCB/NLDC, i.e., BPDB, the Power Division and the regulator, BERC.

Component 2: Operational Enhancements (US\$ 30 million by IDA)

This investments to improve operation will target the performance of NLDC in system management. The key elements are automation, integration of generators into the system, and moving to merit-order dispatch. This component will fund following sub-activities:

(i) Sub-component 2.1: Integration of Generators to the NLDC's SCADA/EMS system (US\$15 million).

This component will finance the procurement of the hardware and software identified above that will eventually be needed for the plants to be fully effective in providing both primary and secondary control. It will include Remote Terminal Units, enhancement of the plant SCADA system, replacement of generator controls, Automatic Voltage Regulators, Power System Stabilizers, etc.;

(ii) Sub-component 2.2: Upgrading/Modernization of NLDC, SCADA/EMS software (US\$5 million).

It will cover procurement of software for real-time economic dispatch control, operator load flow, AGC and modeling power system dynamics, including licenses for five years so that NLDC staff are able to fully utilize the SCADA/EMS system. The software will enable the monitoring of generators for frequency control and dispatch; and

(iii) Sub-component 2.3: Optimization Software for Dispatch (US\$ 10 million). The dispatch optimization software/engine will include week-ahead, day-ahead and hourly simulation capabilities to run fuel and



transmission constrained dispatch optimization in an off-line mode and online (integrated with the SCADA/EMS) system. This sub-component will include a minimum of one license for five years with at least three user-keys, preparation of a dataset and analysis, and training on the dispatch system.

Component 3: Removal of Transmission Bottlenecks and Improvement of Voltage Quality (US\$ 9 million by IDA). This component will cover the needed network reinforcement including:

(i) The upgrade (by re-conductoring with higher capacity conductors) of selected congested 132 kV and 230 kV transmission lines (US\$ 3.5 million) to address existing bottlenecks and enhance system transfer capability; and

(ii) Dynamic Line Rating (DLR) to improve utilization of limited transmission capacity of total 382 km long, seven critical transmission lines, identified by PGCB (US\$ 5.5 million).

The DLRs and other investments to improve voltage quality will be prioritized for highest impact during implementation and additional system-wide investments may be rolled out in the future, beyond the current phase.

E. Implementation

Institutional and Implementation Arrangements

PGCB is the implementing agency. It has set up a Project Management Unit (PMU) to supervise the project. It has experience of working with two World Bank-funded projects. It has completed power evacuation component of the Siddhirganj Power project and has been working with the Rural Electricity Transmission and Distribution project. PGCB has demonstrated good performance in implementing both the projects specially, in procurement, safeguards and construction management. It has experience also in undertaking environmental and social impact assessment and implementing resettlement action plans in compliance with Bank's guidelines and policies. It has an approved organogram of an Environmental and Social Unit (ESU) and agreed to staff it. PGCB has assigned a Project Director to lead the PMU. The PMU staffing includes:

- Dedicated Design & Supervision Engineers.
- Procurement Experts. The mission has suggested PGCB to strengthen the Procurement Team. Two procurement consultants (one global and one local) available in another project of the Bank that has built PGCB's procurement capacity and will be available for this project.
- Financial Management Experts- Strengthening will be done. A civil servant of Administrative cadre has recently joined as Member (Finance).
- Safeguard Experts: A dedicated ESU (environment and social unit) is already established and permanent positions approved. It was agreed that one (1) Environmental, and one (1) Social Expert will be recruited from the market no later than end of March 2017.

GOB has established a Grid Stability Committee in November 2015 to ensure quality of electricity in the national grid and maintain stability of supply. It is composed of BPDB, NLDC, Independent Power Producers (IPPs) and Generation Companies in the public sector. Its mandate, among others, is to maintain system frequency with free governor mode operation (FGMO) and conduct necessary trials. The complexity of the project will require the close cooperation between the generators, BPDB, and



PGCB. Ongoing cooperation between those parties around the trial exercise shows already a commitment to work together. A Memorandum of Understanding (MOU) will be formalized within 2 months of Credit effectiveness between BPDB and the other stakeholders to ensure the continuous cooperation.

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F. Project location and Salient physical characteristics relevant to the safeguard analysis (if known)

The proposed project will cover NLDC, Dhaka with Transmission network all over the country. The exact line routes and locations are yet to be identified. An Environmental and Social Management Framework (ESMF) has been adopted by the PGCB. The ESMF lays out the requirements and procedure for the environmental and social impact assessment which will be followed once the line routes are identified. The ESMF also describes the process for alternative site selection, examples of environmental and social assessment for transmission lines, and environmental and social baselines.

G. Environmental and Social Safeguards Specialists on the Team

Sabah Moyeen, Nadia Sharmin

SAFEGUARD POLICIES THAT MIGHT APPLY

Safeguard Policies	Triggered?	Explanation (Optional)
Environmental Assessment OP/BP 4.01	Yes	Transmission and distribution schemes are generally considered as environmentally clean and non-polluting in nature. Their impacts on environment



are normally restricted to rights of way (ROW). New construction/upgradation may require rehabilitation of the old transmission lines and substations and the key related environmental management issue would be the collection and disposal of old transformers and capacitors. In view of subprojects nature, the overall project is classified as a Category 'B' and the safeguard policy OP/BP 4.01 has been triggered to ensure that the sub project design and implementation will be focused on reducing adverse impacts and enhancing positive impacts. The environmental and social management framework (ESMF) has defined the procedure for environmental and social screening/assessment for each subproject (exact routes and locations of the transmission/distribution lines and substations). Before approval of each subproject, environmental and social screening and assessment will be carried out with environmental management plan (EMP) and resettlement action plan (RAP) that will include subproject specific mitigation and monitoring measures. In addition, Environment Code of Practice (ECoP) have been prepared and included in the ESMF. EMP and ECoP with cost will be incorporated in the tender documents of work contracts. The cost of implementation will be calculated and will be incorporated in the tender document. Site specific EMP and RAP will be prepared for any line routes and SVC locations before the bid process in accordance with the ESMF.

Natural Habitats OP/BP 4.04

No

There is no natural habitat formed largely by native plant and animal species in or surrounding the alignment of the transmission line to be upgraded under the project. No possibility for affecting any natural habitat.

Forests OP/BP 4.36

No

There is no forest area in or around the subprojects area and no possibility for affecting the Forest due to the upgrading of Existing transmission lines. As such, the policy has not triggered.

Pest Management OP 4.09

No

The project is not expected to finance any synthetic chemical pesticides activities and the policy has not triggered.

Physical Cultural Resources OP/BP 4.11

No

Since the activity is limited to the improvement of technical efficiency and upgradation of existing transmission line, no impact on landscape with



		archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance is expected.
Indigenous Peoples OP/BP 4.10	No	There is no indigenous people in the vicinity of the transmission line and sub-station subprojects.
Involuntary Resettlement OP/BP 4.12	Yes	The project includes upgrades to a limited number of transmission lines. Although exact line routes and locations are not known no significant social impacts are anticipated. However, some minor and temporary resettlement impacts may occur. PGCB has adopted a social management framework (SMF) with the project ESMF for guidance in carrying out social impact assessment of subprojects, and prepare and implement RAPs.
Safety of Dams OP/BP 4.37	No	
Projects on International Waterways OP/BP 7.50	No	
Projects in Disputed Areas OP/BP 7.60	No	

KEY SAFEGUARD POLICY ISSUES AND THEIR MANAGEMENT

A. Summary of Key Safeguard Issues

1. Describe any safeguard issues and impacts associated with the proposed project. Identify and describe any potential large scale, significant and/or irreversible impacts:

The Project is expected to finance to upgrade (re-conductoring and dynamic line rating, DLR) of selected, congested 132 kV and 230 kV lines to enhance system transfer capability (\$ 9 million) and voltage stability.

The project is classified as a Category B project and the Environment Assessment (OP/BP 4.01) safeguard policy has been triggered to ensure that the project investment are environmentally sound, sustainable and thus help to improve decision making. No large-scale infrastructure investment or major expansion will be implemented under the project. The environmental impacts of the project are expected to be mostly construction related and limited within the project boundaries. These impacts can be mitigated through implementation of appropriate environmental code of practice and environmental management plan.

Since the line routes, size and extent of the sub-projects remain unknown at the project appraisal stage, a framework approach has been adopted for the Project. An Environmental and Social Management Framework (ESMF) has been prepared based on preliminary studies of few possible locations and surveys of proposed routes of rehabilitation/upgrade of transmission lines.

2. Describe any potential indirect and/or long term impacts due to anticipated future activities in the project area:

The location specific interventions to be financed under the Project will be finalized during the project implementation



phase and as such the exact locations, size and extent and the degree of impact of the subprojects to be funded under the projects are not known at this stage. However, the project requires careful health and safety measures during implementation and operation phases as the activities involve transmission of electricity. It is expected that the Project activities are not expected to cause any long term or irreversible environmental impact. The long-term indirect impact is the development of rural areas with better electricity connection. This may convert some agricultural and/or nonproductive land into commercial/industrial purposes.

3. Describe any project alternatives (if relevant) considered to help avoid or minimize adverse impacts.

As mentioned earlier, the details of subprojects and their actual locations are not known at this stage. The ESMF has the provisions for subproject specific alternative analysis. In general, for any sub-project, the analysis of alternative should focus on: Alternative location (for static VAR compensations, SVCs if any) or route (for power line); Alternative design and technology; Costs of alternatives; and No subproject scenario. The NLDC/PGCB authority will carry out screening at all proposed alternative routes of the power line based on the screening form. Then the environment and social details of these alternatives will be analyzed as per guidance provided in the ESMF. Important considerations include avoiding homestead areas, as much as possible; avoiding crossing of rivers/ forests/ natural habitats/hills/bamboo groves/cash-in trees, as much as possible. If the homestead areas (or other sensitive infrastructure) are not avoidable in any of the options, the NLDC/PGCB will consult with the owner/respective authority and collect their no objection for the construction of transmission and distribution lines in written. On the other hand, use of a government-owned land for construction of substation would significantly reduce adverse socioeconomic impacts. If that is not possible, efforts should be made to avoid ecologically or socially critical areas for construction of substation.

4. Describe measures taken by the borrower to address safeguard policy issues. Provide an assessment of borrower capacity to plan and implement the measures described.

PGCB has prior experience in implementing the IDA funded projects and it has implemented the “Siddhirganj and Maniknagar 230kV Transmission Line Project” under IDA financed Siddhirganj Power Project. Also they are implementing the subprojects under Rural Electricity Transmission and Distribution Project of the World Bank. PGCB created an Environment and Social Management Unit (ESU) in their regular organogram. The PGCB have kept the provision of short and long-term training courses of their concerned officials on environmental management for the institutional capacity building. The ESU is expected to be staffed with specialists after all necessary clearances by January 31, 2017.

The ESMF has elaborated the supervision and monitoring requirements of the environment management plan (EMP) and Environmental Code of Practice, ECoP. The quarterly progress on environmental implementation will be reported in detail along with the Project Progress Report.

5. Identify the key stakeholders and describe the mechanisms for consultation and disclosure on safeguard policies, with an emphasis on potentially affected people.

The ESMF presented a guideline for carrying out consultation, including guidelines on nature (FGD/ informal meetings) and number of consultations, location, and type of participants. Several field level consultations with the key stakeholders including the PGCB and NLDC field level staffs, and communities have been carried out during the preparation of the ESMF. As a part of disclosure, summary of the ESMF report has been translated into Bangla and will be disseminated locally. Copies of the report (both in English and Bengali) will be sent to concerned offices of PGCB and NLDC and will be made available to the public. In accordance with WB access to information policy, the ESMF report has also been uploaded in the website of PGCB/NLDC and in the Bank InfoShop. The draft ESMF will be presented in a national workshop in March 2017.



B. Disclosure Requirements

Environmental Assessment/Audit/Management Plan/Other

Date of receipt by the Bank	Date of submission to InfoShop	For category A projects, date of distributing the Executive Summary of the EA to the Executive Directors
01-Dec-2016	26-Dec-2016	

"In country" Disclosure

Bangladesh

02-Jan-2017

Comments

Resettlement Action Plan/Framework/Policy Process

Date of receipt by the Bank	Date of submission to InfoShop
01-Dec-2016	26-Dec-2016

"In country" Disclosure

Bangladesh

02-Jan-2017

Comments

C. Compliance Monitoring Indicators at the Corporate Level (to be filled in when the ISDS is finalized by the project decision meeting)

OP/BP/GP 4.01 - Environment Assessment

Does the project require a stand-alone EA (including EMP) report?

Yes

If yes, then did the Regional Environment Unit or Practice Manager (PM) review and approve the EA report?

Yes

Are the cost and the accountabilities for the EMP incorporated in the credit/loan?

Yes

OP/BP 4.12 - Involuntary Resettlement



Has a resettlement plan/abbreviated plan/policy framework/process framework (as appropriate) been prepared?

Yes

If yes, then did the Regional unit responsible for safeguards or Practice Manager review the plan?

Yes

The World Bank Policy on Disclosure of Information

Have relevant safeguard policies documents been sent to the World Bank's Infoshop?

Yes

Have relevant documents been disclosed in-country in a public place in a form and language that are understandable and accessible to project-affected groups and local NGOs?

Yes

All Safeguard Policies

Have satisfactory calendar, budget and clear institutional responsibilities been prepared for the implementation of measures related to safeguard policies?

Yes

Have costs related to safeguard policy measures been included in the project cost?

Yes

Does the Monitoring and Evaluation system of the project include the monitoring of safeguard impacts and measures related to safeguard policies?

Yes

Have satisfactory implementation arrangements been agreed with the borrower and the same been adequately reflected in the project legal documents?

Yes

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APPROVAL

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