



# Project Information Document/ Integrated Safeguards Data Sheet (PID/ISDS)

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Concept Stage | Date Prepared/Updated: 14-Jul-2016 | Report No: PIDISDSC17963



**BASIC INFORMATION**

**A. Basic Project Data**

Country Bangladesh	Project ID P159807	Parent Project ID (if any)	Project Name Power System Reliability and Efficiency Improvement Project (P159807)
Region SOUTH ASIA	Estimated Appraisal Date Dec 20, 2016	Estimated Board Date Mar 30, 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.	

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**Financing (in USD Million)**

Financing Source	Amount
Borrowing Agency	8.00
Borrower	17.00
International Development Association (IDA)	75.00
<b>Total Project Cost</b>	<b>100.00</b>

Environmental Assessment Category  
B-Partial Assessment

Concept Review Decision  
Track II-The review did authorize the preparation to continue

Other Decision (as needed)

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**B. Introduction and Context**

Country Context

Bangladesh’s economy has grown at an average of 6 percent p.a. over the past decade leading to the country moving up to lower-middle income country (LMIC) status in FY14 as per capita GNI of \$1,080 crossed the MIC threshold of \$1,046. Over the last twenty-five years, the national poverty rate also fell -- from 58.8 percent in 1991-92 to 24.8 percent in 2015. Challenges to poverty reduction and shared prosperity remain, however, that *inter alia* include ensuring that the appropriate quality and quantity of electricity are supplied to consumers.



The supply of power has not been able to keep pace with rapid growth in annual electricity demand, resulting in frequent outages and load shedding. Current installed generation capacity in Bangladesh is 12,340 MW, while available capacity is only 8,500 MW. The highest demand ever served was 8,350 MW in April 2016. On average, over 1,000 MW of load shedding occurs in the summer. Electricity demand is projected to grow by more than 10 percent per annum over the medium term. The Power Sector Master Plan 2015 (under preparation) has projected that demand will rise to more than 50,000 MW by 2041.

The shortage of electricity and poor quality of supply (voltage fluctuations, blackouts) not only affect households, but also industry and services, which account for the bulk of growth in the economy. This is hence a key constraint to job creation and poverty reduction. According to the 2013 World Bank Enterprise Survey, Bangladeshi businesses on average suffered power outages for 840 hours per year, resulting in an output loss of approximately 3 percent of GDP. More recently, the entire nation was subjected to a black-out in November 2014 consequent upon a shock to the grid.

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#### Sectoral and Institutional Context

The power sector in Bangladesh has grown rapidly over the last decade - generation capacity has doubled at the same time as peak demand increased from 4,530 MW in 2010 to more than 8,000 MW in 2015 (not taking account of significant suppressed demand). However, per capita consumption of electricity in Bangladesh is only 392 kWh/year, which is one of the lowest levels in the world and lower than other large South Asian countries. Also, only about 74 percent of the population has access to electricity. While urban areas have close to complete electricity coverage, only 42 percent of rural households have access to electricity. Thus, growth in demand for electricity in the coming years is a given.

Natural gas currently fuels two-thirds of Bangladesh's power generation, but gas shortages have started to constrain the growth of power supply and, in combination with inefficient practices and lack of exploration, have led to the widespread use of more costly liquid fuel (furnace oil and diesel) to generate power. The increase in liquid fuel use has nearly tripled the system-wide average cost of electricity generation in recent years, while consumer tariffs remain below cost recovery levels, imposing a sizeable fiscal burden in the form of subsidies to compensate for the higher generation cost of so-called 'emergency' liquid fuel fired generators.

An additional challenge faced by Bangladesh's power sector is ensuring the quality and reliability of the power supplied and the security of the power system, i.e., ensuring that the system is not subject to wide voltage fluctuations and outages and can cope with unanticipated swings in demand/supply or other shocks. This not only requires proper frequency management, but also building resilience into the system. As the system increases in size it will also become increasingly susceptible to cascading outages resulting in huge economic losses if not managed appropriately.

The Government's goals of achieving universal access to power by 2021 and meeting a projected 50 GW in peak demand by 2041 thus require: significant investment in new capacity consistent with the country's least cost generation plan; improved availability of fuels and efficiency of allocation and use; reduction of



inefficiencies in dispatch; and, enhanced system supply capabilities. The Government is proceeding on parallel tracks in terms of public and private (IPPs) investment in power generation as well as working to increase the import of power from India. Improving system dispatch and operational efficiency will be important for scaling up the import of power.

Institutionally, the Ministry of Power, Energy, and Mineral Resource (MPEMR) has responsibility for the power sector. The vertically integrated Bangladesh Power Development Board (BPDB) under 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 along with the separation of generators from distributors. PGCB with the National Load Dispatch Center (NLDC), is also the system operator, with responsibility to dispatch generators and run the system in a secure and reliable manner. It is paid a wheeling charge determined by the Bangladesh Energy Regulatory Commission (BERC).

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There is room for considerable improvements in the operation of the transmission grid. A recent World Bank review of the robustness of the dispatch and transmission system in Bangladesh indicates that a few key interventions would go a long way towards (i) improving system security and reliability (minimizing outages and preventing wider blackouts when there is a sudden outage); and, (ii) increasing the efficiency or cost effectiveness of system operation by ensuring that the system draws on the lowest cost power (e.g., that generated by large plants with economies of scale) before calling upon more expensive power, so-called “merit-order” dispatch.

#### Relationship to CPF

The Country Partnership Framework for FY 2016-2020 (CPF) identifies the following priorities for the energy sector, ‘increasing supply of electricity and gas, diversifying sources of power supply, retiring polluting and expensive emergency diesel generators, reducing energy subsidies.’ The CPF is anchored in Bangladesh’s 7<sup>th</sup> Five Year Plan and recognizes the need for additions to generation capacity while squeezing inefficiencies out of the entire system to the extent possible. Ensuring merit order dispatch, enhancing transmission capacity to limit congestion and ensure efficient evacuation of power, and improving the operation of the grid are key priorities for Bank support. These priorities are also consistent with the Government’s power sector strategy, which seeks to ameliorate the country’s severe shortage of power while increasing the efficiency of use of scarce domestic gas.

### **C. Proposed Development Objective(s)**

Improve the reliability and efficiency of the power system in Bangladesh

Key Results (From PCN)



1. Enhanced reliability (system stability and resilience) measured by
  - a. Reduction in frequency variation over a specified audit period (with the band narrowing to 49.5-50.5 Hz from the current range of 49-51 Hz).
2. Improved efficiency of system operations measured by
  - a. Reduction in the average cost of power produced.
  - b. Reduction in spending on oil (HFO, diesel) used in generation system-wide.
3. Reduction of transmission bottlenecks (selected lines)
  - a. Lower transmission losses in the lines which are upgraded.
4. Improved quality of voltage
  - a. Reduction of voltage fluctuations over the audit period at substations where SVCs have been installed.
5. NLDC operational capacity enhanced
  - a. Evidenced by number of staff trained, and observed installation and use of state- of-the-art dispatch and frequency control protocols.

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#### **D. Concept Description**

Bangladesh’s small but growing power system has much room for improvement in the reliability and quality of supply. There are wide variations in voltage and frequent outages and the system is vulnerable to shocks. System operation is reliant on manual control, which has resulted in significant deviations from merit-order in dispatch and has been detrimental to system economics and security.

The World Bank has carried out a review of dispatch efficiency in collaboration with NLDC, using a standard dispatch optimization approach. The following are the key findings of this analysis, which used actual hourly dispatch data from 2014:

- i)The estimated total system-wide cost of power supplied to the grid in 2014 was \$ 2.2 billion. Under an optimal dispatch scenario this would have been \$ 0.55 billion, pointing to the potential to reduce system costs by 76 percent (\$ 1.65 billion);
- ii)Ongoing out-of-merit dispatch of oil-based generation costs the system \$1 billion per year. Optimal dispatch would reduce reliance on oil-based generation;
- iii)Increasing the allocation of gas for power by a modest 200 million cubic feet per day would reduce the cost of generation and could eliminate about \$500 million of the annual subsidy paid to bridge the gap between the cost of supply and the consumer tariff; and,
- iv)Rapid expansion of the power system is likely to further challenge system stability.

The study determined that the observed deviation from optimal dispatch stems from a lack of automation in system operation and the absence of modern, optimization-based dispatch protocols and training in NLDC. Key transmission lines need to be upgraded so as to address transmission bottlenecks and system congestion – these bottlenecks to balancing flows have led to reliance on localized oil-fired generation to augment supply. Finally, NLDC will need the cooperation of generators to be able to manage fluctuations in frequency with minimal delay. Development of an automated modernized dispatch function with



associated investment in transmission will thus improve system stability and security of supply and also bring about considerable cost savings.

The project will therefore include technical assistance and associated investments to improve the performance of NLDC in system management (key elements being automation, integration of generators into the system, and moving to merit order dispatch). It will also invest in upgrading lines to remove transmission bottlenecks. The project has three components: Technical Assistance, and investment in Operational enhancements and in Transmission upgrades.

(i) Technical Assistance (\$7 million). This comprises support for :

(a) Primary Frequency Control Trials and training for NLDC engineers/operators on modern, state-of-the-art frequency control and dispatch protocols (\$ 4million). The frequency control trials are pre-requisite to and will be followed by implementation of primary governor control in at least 15 power generation plants and commencement of automatic frequency regulation by NLDC; and

(b) Capacity Building and Institutional Review (\$3 million).

(ii) Investment in Operational Enhancements (\$20 million). This comprises of :(i) Integration of generators to the SCADA/EMS System (\$10 million); (ii) Upgrading/Modernization of the SCADA/EMS software to NLDC (\$5 million); and (iii) Optimization software for dispatch for NLDC (\$5 million). Currently, the NLDC in Dhaka is not integrated with the SCADA system of the power generation plants in the system and is unable to send/receive signals for changing outputs; nor does it receive real time demand forecasts from the distribution companies.

(iii) Investment in Transmission (\$48 million). This comprises of: (i) The upgrade (re-conductoring) of selected congested 132 kV lines to 230 kV to enhance system transfer capability (\$ 20 million); (ii). Dynamic Line Rating (DLR) to improve utilization of limited transmission capacity on 400 km of three critical transmission lines identified by PGCB (\$3 million); and (iii) Static VAR Compensator (SVC) trials in identified locations to enhance voltage stability by improved reactive power management (\$25 million).

The DLR and SVC investments may be rolled out system-wide in future.

In terms of readiness, PGCB has already carried out the first frequency control trial and achieved the expected results. The trial is expected to continue with larger generators and a higher volume of generation. PGCB has hired an international system operations consulting firm (DigSilent, Australia) who visited NLDC, conducted a training workshop on frequency control and visited a few generators in December 2015. They undertook a technical appraisal of the existing transmission infrastructure and system operations and prepared an action plan to improve system operations. The three project components can be launched in parallel, which will reduce project implementation time.

## SAFEGUARDS

### A. Project location and salient physical characteristics relevant to the safeguard analysis (if known)

The project is mainly located at NLDC Building, Aftabnagar, Dhaka. It has three main components- a) TA, b) Operational



enhancements, and c) Infrastructure debottlenecking (upgrading of existing transmission line and installation of SVCs). The transmission line route is known and locations for SVCs are being identified. These will be installed inside existing substations. All these will entail minimal social issues. There will be construction phase disturbances and reconductoring of transmission line may create temporary social issues. An EA and RAP/SAP will be prepared to determine the scope and nature of safeguards impacts.

**B. Borrower’s Institutional Capacity for Safeguard Policies**

PGCB has experience in undertaking environmental and social impact assessment and implementing resettlement in compliance with Bank guidelines and policies. They have an approved organogram of an Environmental and Social Unit. PGCB has agreed to staff it soon.

**C. Environmental and Social Safeguards Specialists on the Team**

**D. Policies that might apply**

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Safeguard Policies	Triggered?	Explanation (Optional)
Environmental Assessment OP/BP 4.01	Yes	The project includes infrastructure works (upgrades to transmission lines) that will require an EA.
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 line or installation of SVCs. 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	No significant social impacts are anticipated.



However, some minor and temporary resettlement impacts will occur. OP 4.12 triggers. PGCB has experience in undertaking social impact assessments and in implementing resettlement in compliance with Bank's guidelines and policies. The project includes upgrades to a limited number of transmission lines, which may trigger this policy depending upon the line route. PGCB is working to carry out an ESIA and RAP for the sub-projects.

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

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**E. Safeguard Preparation Plan**

Tentative target date for preparing the Appraisal Stage PID/ISDS

Oct 31, 2016

Time frame for launching and completing the safeguard-related studies that may be needed. The specific studies and their timing should be specified in the Appraisal Stage PID/ISDS

RAP will be prepared, cleared and disclosed by appraisal.

PGCB will launch the EA on July 15. Draft ESIA be available on October 31. Appraisal stage PID/ISDS will be disclosed in the last week of November 2016.

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**APPROVAL**

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