

**Terms of Reference (ToR)**  
**for**  
**Consulting Services for Analysis of Transmission and Distribution Losses and**  
**Establishing Loss Targets**

*1. Background*

Electricity plays a pivotal role for the socio-economic development of a country. It has been identified as one of the main ingredients for achieving sustainable development goals worldwide. In recent years Bangladesh has experienced booming economic growth, rapid urbanization and increased industrialization. Government ‘Vision 2021’ encompasses the target for ensuring affordable and quality power supply for all. The Government of Bangladesh has taken immediate, short, medium and long term power generation plan along with transmission and distribution network expansion in order to fulfill the vision and commitment of the government.

The power sector in Bangladesh has gone through a revolutionary change since 2009. Before 2009 power generation capacity was less than 5,000 MW while actual generation was 3200 MW. Load shedding was frequent where industries have experienced regular power cut for hours together. On the other hand, within the last 8 years, generation capacity has reached at about 15,000 MW and actual generation has picked upto 9036 MW.

In order to achieve the goal set by the government and attain the Sustainable Development Goals (SDG), power system of Bangladesh needs to be further strengthened. Efficiency improvement of the power system will not only provide electricity to all the people of the country, but also accelerate the economic growth. The successful completion of this project will surely help in realizing an efficient power sector.

It has been identified that in distribution system major system loss occurs at five distinct segments of network such as (a) 33KV sub-transmission lines, (b) 11KV distribution lines, (c) Distribution transformers (d) LT distribution lines and (e) Service drop and energy meters.

Technical and commercial losses in Bangladesh are lower when compared with regional experience, but there is significant room for improvement. The study will establish a scientific methodology and procedure to establish technical losses in the transmission network and in each distribution utility network, considering the network topology, customer mix, load profiles, etc., to identify allowable technical losses. Thus the remainder would be commercial losses, which the utilities would require to rapidly reduce. Results of the study will be used for regular system loss target fixing as KPI by the Power Cell and entities using a scientific approach.

With this end, Power Cell, Power Division, Ministry of Power, Energy and Mineral Resources intends to appoint Consultant (at firm’s level) to conduct a study of Transmission and Distribution losses of the respective entities. The project expenditure will be borne from the fund of the Asian Development Bank.

## **2. Objectives of the Assignment**

The objectives of this study are:

- Disaggregation of technical and commercial losses in each transmission and distribution entity;
- Standardization of losses;
- Setting annual loss targets and frame out a strategy to reduce losses.

## **3. Scope of Services, Tasks, Components and Expected Deliverables**

### **3.1 Scope of Services**

The following are the scope of services of the consultants who would conduct a reconnaissance study but not limited to:

As a whole, combined technical and commercial losses in the transmission and distribution network in Bangladesh is about 13.10% on net generation. During FY 2015-16, distribution loss of the distribution entities were BPDB: 10.66% (average across BPDB's six distribution zones), BREB: 12.36%, DPDC: 9.18%, DESCO: 8.03% and WZPDCL: 9.98%. At the same time during FY 2015-16 all entities average distribution loss was 10.96%. A substantial amount of electricity is sold to the bulk consumers at 33 kV and 11 kV level. It gives opportunities to lower technical and commercial losses. However the distribution loss to serve retail consumers at lower voltage level is expected lower than the present distribution loss. Technical loss can be reduced to cost-optimal levels through investments on line up-gradation, using quality distribution transformers and appropriate network and transformer loading. Commercial losses can be managed and reduced more rapidly by minimizing metering problems, meter errors and theft.

The main objective is to study the system loss of the transmission and distribution entities (PGCB, BPDB, BREB, DPDC, DESCO, WZPDCL and NWZPDC). To perform the scope of work successfully the following tasks are needed to be accomplished by the Consultant.

**3.1.1** The system loss study will be carried over in the following distribution areas on sample basis. The areas will be finalized before proposal submission in consultation with the respective entities. The proposed areas/locations for study are mentioned below:

#### Distribution entities' loss study (on selected substation and feeder on sample basis)

- i) 10 Electric Supply Units (ESU) in 6 zones of BPDB.
- ii) 10 PBSs out of 78 PBSs of BREB.
- iii) 8 Network Operation & Customer Service (NOCS) of DPDC.
- iv) 8 Sales & Distribution unit of DESCO.
- v) 8 Sales & Distribution unit of WZPDCL.

The study would assess the technical losses at 33 kV network, 33kV/11kV substation transformers, 11kV lines, distribution transformers and LV lines/service drops. It would also assess the technical losses to be allowed in metering equipment. Thereafter, commercial losses would be estimated on the basis of present inputs to the network and the energy sold and by disaggregating the commercial losses across each segment of the network.

#### Transmission entity's loss study

Study of PGCB's transmission loss on the basis of present metering system, energy wheeling and energy import. The study will be carried on sample basis. The sample will be designated before proposal submission.

**3.1.2** Establish and conduct sample studies, case studies and simulations and secure the assistance of the distribution entities to conduct on-site measurements and accounting to establish the validity of model results.

**3.1.3** Consultant will conduct the study using latest software. The existing updated single line diagram (SLD) and system data will be used for the study purpose.

**3.1.4** The Consultant will review existing literature of system loss calculation methodologies of Power Cell and entities.

**3.1.5** Evaluate the depth and accuracy of meters available in the respective entity to measure loss at each voltage level with the assistance of the entity.

**3.1.6** Review the meters, metering points, coverage by SCADA system to facilitate transmission loss into voltage levels.

**3.1.7** Establish the methodology for the determination of distribution losses and their disaggregation into technical and commercial losses at each voltage level, plan and conduct case studies and modeling work to develop the impacts of consumer mix, peak off peak load, feeder lengths, etc.

**3.1.8** Discuss ways and means and investment requirement to reduce both technical and commercial losses.

**3.1.9** Based on agreed methodology develop the consecutive next five year technical and commercial loss targets (e.g. FY2017-FY2021 or as agreed) at each designated entities.

**3.1.10** Conduct a workshop to discuss and disseminate the findings, achievements of the projects and way forward among the Power Division, Power Cell and entities.

***3.2 Downstream work is not required.***

***3.3 Training is not a specific component of the assignment.***

#### **4. Team Composition & Qualification Requirements for the Key Experts**

4.1 The preferred experience of proposed key professionals is as follows:

##### **a. Team Leader / Power Distribution Planning Specialist (International)**

At least Master degree in Electrical Engineering with a minimum 20 years of professional experience in power distribution planning and modeling, distribution line design, system analysis, operation, software based data analysis and maintenance of electric utility. S/he will be responsible for successful implementation of the project. S/he must have working experience as a Consultant in electric utilities of developing countries on distribution and transmission system planning, facility design, system loss reduction and maintenance.

##### **b. Power Transmission Planning Specialist (International)**

At least Master degree in Electrical Engineering with a minimum 15 years of professional experience in power transmission planning and modeling, transmission line design and grid operation. S/he will assist the Team Leader to carry out the project implementation.

##### **c. Distribution Modeling Engineer (International)**

At least bachelor degree in Electrical Engineering with minimum 8 years professional experience in electric utility. Distribution Modeling Engineer will assist the Power Distribution Planning Specialist to conduct modeling of the distribution network of each utility/entity and specifically assist in data preparation, metering and system analysis. S/he must have adequate knowledge in latest distribution software and network analysis.

##### **d. Power Distribution Planning Specialist (National)**

At least bachelor degree in Electrical Engineering with minimum 10 years of working experience in similar job preferably in distribution planning, design and load flow analysis. S/he should have experience in modeling process and distribution software. They will be responsible for coordinating with all team members to provide local inputs and support and actively participate in the information collection and modeling process.

##### **e. Power Transmission Planning Specialist (National)**

At least bachelor degree in Electrical Engineering with a minimum 10 years of working experience in power transmission planning, design and grid operation. S/he will assist the Power Transmission Planning Specialist (International).

#### **f. Distribution Modeling Engineer (National)**

At least bachelor degree in electrical engineering with minimum 5 years professional experience in power distribution system. S/he must be well conversant with WindMil software or recognized distribution planning and design software.

#### **g. Distribution Engineer (National)-2 Persons**

At least bachelor degree in Electrical Engineering with minimum 5 years professional experience in power distribution system. They will assist the Power Distribution Planning Specialist and other members of the project to conduct modeling of the distribution network of each utility/entity and specifically assist in data collection, analysis and field work.

### **4.2 Supporting Staff**

The Consultant will engage required supporting staff including the following personnel to conduct the study as scope of works:

#### **a. AutoCAD Operator**

Diploma in Engineering with a minimum 3 years working experience in AutoCAD software.

#### **b. Data Entry Operator**

Minimum HSC with skill in word processing/ data processing and computing.

#### **c. Field Enumerator**

Diploma in Engineering with a minimum 3 years working experience in AutoCAD software.

#### ***Duration of the Assignment:***

The duration of this project will be 12 months from the date of contract signing. It is expected that the Consultant will propose required man-months for this study.

#### ***Evaluation Criteria for the Consultants***

The evaluation of consultants will be done according to the categories mentioned below:

- Qualification and experience of the key professional
- Experience in similar assignment
- Experience in Bangladesh Power Sector
- Work methodology and plan

### ***5. Reporting Requirements and Time Schedule for Deliverables***

*At a minimum, list the following:*

*(a) Reports to be submitted*

- i) Inception Report:** The Consultant will prepare and submit an inception report within one month from signing of the contract stating their understanding of the subject, concept on the requirements of subject to perform the study and their readiness to undertake the project.
- ii) Interim Report:** The Consultant will prepare and submit an interim report within four months from the acceptance of the Inception Report.
- iii) Draft Final Report:** The Consultant will prepare and submit Draft Final Report within two months from the acceptance of the Interim Report. The Consultants shall interact with the distribution entities for exchange of views for preparation of DFR. The comments received thereof shall be taken into consideration for the incorporation/preparation of the DFR.
- iv) Final Report:** Final Report shall be prepared within 1 (one) month of the acceptance of the DFR.

*(b) 10(Ten) copies of each report has to be submitted along with a soft copy;*

*(c) persons to receive them;*

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## **6. Client's Input and Counterpart Personnel**

*(a) Services, facilities and property to be made available to the Consultant by the Client:*

### **Facilitation and Reporting**

Power Cell will ensure access to the available pertinent information to this assignment. Consultant will work in close association with the Power Cell and entities. A coordination mechanism will be set up to review progress, provide guidance and advice. The designated personnel of the entities will interact with the Consultants and provide data, arrange discussions and assistance as required. The Consultant will work under the guidance of Power Cell. The day to day work will be monitored by Director (Commercial), Power Cell.

### **Logistics Support**

The Power Cell will provide office accommodation, Counter-part support, local phone /fax facilities. The Consultants will be supposed to use their own computers.

***(b) Professional and support counterpart personnel will not be assigned by the Client to the Consultant's team***

***7. Client will provide the following inputs, project data and reports to facilitate preparation of the Proposals:***

The consultant will have to collect relevant project data and reports from the respective departments as required to successfully completing the study.