

**Terms of Reference (ToR) of Feasibility Study
For
Rearrangement/Alternative for Overhead and Underground High Voltage Transmission
Lines of Dhaka City and adjacent areas.**

1. Company Background:

Electricity plays a pivotal role for the socio-economic development of a country. In the recent years Bangladesh has experienced booming economic growth, rapid urbanization and increased industrialization. Hon'ble Prime Minister has announced the 'Vision 2021' which encompasses the target of ensuring affordable and quality energy supply for all. The Government of Bangladesh has taken immediate, short, medium and long term power generation plans in order to fulfil the vision and commitment of the government. On the other hand, GoB has undertaken several initiatives to build a country-wide power network (transmission & distribution), targeting to provide electricity to all by 2021. However, the massive power generation expansion plan as per PSMP and the demand growth have posed a number of challenges. The level of reliability of the national grid is required to be substantially enhanced to address the increasing electricity demand, the on-going massive generation addition program, the operational problems and equipment breakdowns.

PGCB is responsible for the operation, maintenance and development of the power transmission system all over Bangladesh. Expansion of the grid network like installation of new transmission line and grid substations are its assigned prime responsibility. Now, the generated power of different power plants all over the country as well as cross-border imported power is evacuated and transmitted through PGCB's integrated grid system by 400 kV, 230 kV and 132 kV transmission lines and substations. In 1996 when PGCB was formed, the total length of 230 kV and 132 kV line were 838 ckt km and 4755 ckt km respectively which increased to 1144 ckt km and 4962 ckt km respectively in 2000-01 fiscal year. At present there are 697.762 ckt km of 400 kV line, 3370.102 ckt km of 230 kV line and 7243.438 ckt km of 132 kV line throughout Bangladesh under PGCB. PGCB has been implementing optical fiber network (OPGW) parallel to its over-head transmission lines to establish digital communication system to improve the control and monitoring of the transmission system.

2. Description of Study:

Bangladesh is a developing country and Industrialization is also at its peak. The energy consumption is increasing rapidly. As a result the power generation and transmission is also growing accordingly. But Bangladesh is a small country with a vast population. Dhaka is the capital of the country and its one of the mostly populated city in the world. The power transmission infrastructure requires lots of land and right of way (ROW) along the line for safety purpose. Moreover the population in the Dhaka city is very high and increasing every year. So land price is also increasing every year. Nowadays it's almost impossible to build new transmission lines inside Dhaka city. PGCB has already faced many difficulties during implementation of ongoing projects adjacent to Dhaka.

It is high time to find some alternatives to avoid land crisis in Dhaka and adjacent area and provide a better way to support the growing power system. The consultant has to study the existing power system and planned system and provide best possible solution to avoid those problems and recommend a way out. Necessary cost will be borne from PGCB's own fund.

3. Objectives:

The Main objectives of the feasibility study:

- a) To find out the feasibility of rearrangement of the existing overhead transmission line of Dhaka City and adjacent area.
- b) To find out how much land requirement and right of way (ROW) can be reduced.
- c) To recommend future planned transmission lines route and type (i.e Overhead or Underground).

4. Scope of the feasibility study:

The Eligible consultant will conduct a qualitative and comparative study on convention of overhead line rearrangement of Dhaka City and adjacent area including DPDC and DESCO Area (which is indicated in RFP Document). The consultant will submit a report considering the following points:

- i) Information of World-wide practices on High Voltage AC Transmission line installation in the city area/densely populated area;
- ii) Data of Existing, under construction, planned overhead (including River crossing) and underground transmission lines.
- iii) Identification of the lines which can be converted from overhead to underground line or any common corridor or recommend any possible alternative.
- iv) Capital costs for the proposed rearrangement/alternative Transmission Network for the same current carrying capacity and impact on voltage drop and transmission loss;
- v) Insulation requirements and Land requirements for the proposed rearrangement/alternative Transmission Network;
- vi) Operation and maintenance procedure and costs for the proposed rearrangement/alternative Transmission Network;
- vii) Installation methods and requirements of special structures for the proposed rearrangement/alternative Transmission Network;
- viii) Facilities for up-gradation, tapping off for the proposed rearrangement/alternative Transmission Network (if required).
- ix) Vulnerability to faults, fault managements and recovery time for the proposed rearrangement/alternative Transmission Network;
- x) Impacts on the environment during and after installation;
- xi) Availability or restrictions of the line routes for other uses;
- xii) Impact of Electro-magnetic fields;
- xiii) Others works which are related to this study report shall require to be performed by the consultant.
- xiv) The Feasibility Study team shall use the same metadata convention and GIS management approach for all GIS data necessary for this study and shall be incorporated with the report.
- xv) The Feasibility Study team shall use PSS/E for load flow and other system studies and shall be incorporated with the report including load flow simulation and system studies soft copy.
- xvi) The Feasibility Study team shall finalize the design and operational standards recognized locally and internationally (e.g., IEC, IEEE, IS, BS, DIN, ATMs or other relevant standards) for technical design of transmission networks and substations, including ensuring voltage within the required range, equipment loaded to standard levels, power factor at optimal levels, and minimum design short circuit ratings for the transmission network etc. with due consideration of Draft Grid Code for planning and operating criteria for voltage, frequency and system overloads.
- xvii) The Feasibility Study team shall also prepare the cost estimation of the alternative transmission lines and shall be incorporated with the report including financial and economic analysis.
- xviii) In case of Overhead Transmission lines the Feasibility Study team shall prepare tower spotting data and the towers shall be spotted with PLS software and strength analysis for the line shall be performed. The computerized PLS-CADD output profile shall show the maximum Sag, hot curve, cold curve, ground clearance curve, weight span, wind span, adjacent span, centre peg setting down, if necessary and any other features deemed appropriate and shall be incorporated with the report.
- xix) In case of Underground Transmission lines the Feasibility Study team shall prepare necessary key point or service points spotting data, layout of Underground lines and any other features deemed appropriate and shall be incorporated with the report.

- xx) For all sites, general geological conditions will be determined and construction constraints will be identified. A map showing the surficial and shallow geological conditions will also be prepared and shall be incorporated with the report.

The route shall be selected considering the following guidelines:

- a. The route shall not cross important infrastructures (i.e residential area, commercial area, industrial area, any Govt. Infrastructures, school, college, e.t.c)
- b. Clearances required from other authorities shall be listed, so that those can be obtained expeditiously.
- c. Future expansion of roads shall be taken into consideration, based on data from other agencies (i.e Road, rail, river, culvert crossings).
- d. Care must be taken to avoid choosing routes, roads, areas that are infected and prone to floods etc.
- e. Route shall be selected such that it requires minimum right of way (RoW). In accordance with the existing Right of Way Rule for Transmission Line in Bangladesh.

The consultant has to describe proper justification considering above criteria. The consultant has to prepare and describe the necessary works to be done and estimate of the costing for the works. Such necessary works and its cost estimation will be included in the report.

5. Assistance during Implementation of the Project

In addition to services described as the scope of works, the Consultant should also extend its support to PGCB in terms of providing written explanations, comments and conclusions whenever required. Such assistance should be extended from its head office only when requested by PGCB in writing.

6. Interface with and assistance from PGCB

The consultant will provide technical expert services to PGCB as described in the scope of works. PGCB is undertaking the general project management of the works including progress monitoring and issue of payment certificates.

Both PGCB and Consultant's teams should work together as one single team in all matters related to the Study. The cost and timing of obtaining the above is entirely the responsibility of the Consultant.

7. Expertise requirement:

Engineering consulting services which will include, but not limited to the following expertise:

Sl No.	Expert Name	Person-Month
International Expert		
1.	Transmission Line Engineer (Team Leader)	5
2.	Civil Engineer (Transmission line-Ducting Expert)	3
3.	Electrical Engineer (Underground Power cable Expert)	4
4.	Electrical Engineer (Transmission Network Expert)	3
Local Expert		
1.	Transmission Line Engineer	3
2.	Civil Engineer (Transmission line-Ducting Expert)	2
3.	Electrical Engineer (Underground Power cable Expert)	2
4.	Electrical Engineer (Transmission Network Expert)	2
5.	Civil Engineer (Survey Expert)	3
6.	Digital Mapping Expert	4

Sl No.	Expert Name	Person-Month
7.	Environmental/Social Specialist	2
8.	Economic/Financial Analyst	2
Total Man-Month		35

The consulting firms are requested to submit end user certificates as evidence of experiences as per requirement. Method of selection of consulting firms is “Quality and Cost Based Selection (QCBS)” (80:20).

i. Transmission Line Engineer (Team Leader)

He/She will be in charge of Transmission Line Consultant under engineering consulting services. He/She should graduate in Civil/Mechanical/Electrical Engineering and shall be fluent in English language for day to day communication. And He/She must have the enough qualification and experience in the relevant field out of which at least fifteen (15) years experience as an engineer for the transmission line project.

ii. Civil Engineer (Transmission line-Ducting Expert)

He/She will be in charge of Civil Consultant under engineering consulting services. He/She should graduate in Civil Engineering and shall be fluent in English language for day to day communication. And He/She must have the enough qualification and experience in the relevant field out of which at least fifteen (15) years experience as an engineer for the transmission line project.

iii. Electrical Engineer (Underground Power cable Expert)

He/She will be in charge of Electrical Consultant under engineering consulting services. He/She should graduate in Electrical Engineering and shall be fluent in English language for day to day communication. And He/She must have at least fifteen (15) years experience in the relevant field as a consultant engineer for the transmission line project/ Underground power lines project.

iv. Electrical Engineer (Transmission Network Expert)

He/She will be in charge of Electrical Consultant under engineering consulting services. He/She should graduate in Electrical Engineering and shall be fluent in English language for day to day communication. And He/She must have at least fifteen (15) years experience in the relevant field as a consultant engineer for the transmission line project/Underground power lines project.

v. Civil Engineer (Survey Expert)

He/She will be in charge of Route survey, land survey and GIS Mapping Consultant under engineering consulting services. He/She should graduate in Civil Engineering/Urban & Regional Planning and shall be fluent in English language for day to day communication. And He/She must have at least Ten (10) years experience in the relevant field as a consultant engineer for the transmission line project/Underground power lines project.

vi. Digital Mapping Expert

He/She will be in charge of GIS Mapping Consultant under engineering consulting services. He/She should graduate in Environmental Science/Geography/Engineering and shall be fluent in English language for day to day communication. And He/She must have at least ten (10) years experience in the relevant field as a consultant engineer for the transmission line project/Underground power lines project.

vii. Environmental/Social Specialist

He/She will be in charge of Environmental specialist under engineering consulting services. He/She should graduate in Environmental engineering and shall be fluent in English language for day to day communication. And He/She must have at least ten (10) years experience in the relevant field as a consultant engineer for the transmission line project.

viii. Economic/Financial Analyst

He/She will be in charge of Economic and Financial specialist under engineering consulting services. He/She should Minimum Master's degree in Economics, Finance, Business Administration or related disciplines with a minimum of ten (10) years experience in econometrics, demand forecasting, cost estimation, financial and economic analysis and other related matter. He/She must be able to run/operate financial model/tool and familiarity with the Bangladesh power sector.

8. Duration:

The engineering consulting services shall be completed within 08 months from signing of the contract.

9. Reports and schedule of Deliverables:

The feasibility study team will prepare a comprehensive report for construction of alternative Transmission lines including:

- i) Base Design/Specifications
- ii) Survey report of transmission route alignment and its optimization
- iii) Report on geotechnical investigations
- iv) Procurement packages, Cost Estimates and Bills of Quantities and specifications to prepare bidding documents to execute/implement to rearrangement works.
- v) Environmental and Social Impact Assessment, Mitigation Measures and Resettlement Action plan including budget estimation.
- vi) Economic and Financial Analysis, Sensitivity Analysis, Risk Analysis of the scope of work.

Report Submission schedule:

- i) Inception report to PGCB within 30 days from signing of the contract.
- ii) Interim report to PGCB within 75 days from signing of the contract.
- iii) Draft final F/S report to PGCB at least one month ahead of its completion of the contract.
- iv) Final F/S report within the completion time.
- v) Field survey report and MOM (Minutes of Meeting) upon request.

10. Payment Schedule

Sl. no	Milestones (submission and acceptance of reports under Scope of Services)	Payment (% of contract price)	Cumulative (% of Contract price)
1.	Contract Signing	-	-
2.	Inception Report (Feasibility Study Reports)	2%	2%
3.	Interim Feasibility Study Report	24%	26%
5.	Draft Feasibility Study Report	34%	60%
7.	Final Feasibility Study Report	40%	100%