

Terms of Reference of Feasibility and Other Associated Studies for “Transmission Grid Network Expansion for Rural Electrification (TGNERE)” Project

1. Background

In recent years, Bangladesh has made significant progress in its efforts to become a middle-income country. This progress is reflected in the strong growth of its economy over the past decade. One key factor contributing to this growth has been the country’s electricity access expansion. In 2009, only 47% of people in Bangladesh had access to electricity, but today, that number has increased to 100% of people having access to electricity coverage. As a result, Bangladesh has joined a select group of countries in South Asia that have achieved universal electricity coverage, meaning that 100% of their populations have access to electricity. This is a significant achievement and has likely contributed to the overall economic development of the country.

The Government of Bangladesh places a high priority on agriculture and rural development to reduce poverty and improve food security for the country's poor. This focus is recognized in the country's constitution, which stipulates that the government should take effective measures to radically transform rural areas. These measures include promoting an agricultural revolution, providing rural electrification, developing cottage and other industries, and improving education, communication, and public health. These efforts aim to progressively eliminate the disparity in living standards between urban and rural areas.

Agriculture is a key sector of the economy in Bangladesh and plays a vital role in the livelihoods of many rural communities. By promoting agricultural development and providing support to rural areas, the government aims to improve the economic prospects and living standards of these communities, while also helping to reduce rural poverty. Additionally, by investing in infrastructure and social services in rural areas, the government hopes to create a more balanced and equitable society, with fewer disparities between urban and rural areas. Overall, the government's efforts to promote agriculture and rural development are an important part of its strategy for achieving sustained economic growth and reducing poverty in the country.

The Government of Bangladesh is committed to providing access to affordable, reliable, sustainable, and modern energy for all people across the country, particularly in rural areas. This aligns with the Sustainable Development Goal (SDG) target of ensuring access to modern energy for all. The use of modern machinery in agricultural production, particularly in rural areas, has increased in recent years and has created new opportunities for livelihoods in these areas. However, if affordable and uninterrupted electricity were more widely available in rural areas, it could further contribute to economic growth and improve the living standards of the rural population. Ensuring access to electricity is a crucial aspect of the government's efforts to promote development and reduce poverty in rural areas. By investing in infrastructure and services that enable the delivery of affordable and reliable electricity to all parts of the country, the government can help to create a more equitable and prosperous society.

The demand for high-quality electricity is increasing in Bangladesh due to the rapid adoption of modern technology-based crop production methods, which have replaced traditional farming techniques. To meet this growing electricity demand, robust transmission systems are crucial. These

systems play a key role in delivering affordable and uninterrupted power to all parts of the country, including rural areas. In order to ensure a reliable electricity supply in these areas, it is necessary to build new grid substations and associated transmission lines. These infrastructure investments are necessary to support the transition to modern technology-based agriculture and to meet the increasing demand for electricity in Bangladesh. By investing in a strong and reliable transmission system, the government can help to support economic growth and improve living standards across the country.

2. Objectives of the study

The Consultant shall prepare the Project's Feasibility Study Report, Topographic Survey, and Route Survey for tentatively known route, Initial Environmental Examination (IEE), Environmental Impact Assessment (EIA), Resettlement Plan (RP), Indigenous Peoples Plan (IPP), Climate Change Assessment, Financial and Economic analysis, and/or other instruments for preliminarily identified subprojects in accordance with the latest safeguard requirements of ADB Safeguard Policy Statement (2009).

The objectives of the project are described below but are not limited to:

- i. Prepare the rationale for the proposed project including reviews of country overview, power sector overview, institutional arrangement and constraints, and innovative (technical) suggestions for the project. The review should justify the project with respect to the 8th 5-year plan, integrated energy and power master plan (IEPMP), and any other strategy, policy or master plan as deemed relevant.
- ii. Analysis of the technical features of the national transmission grid network for the projected scope of works to understand the status of the existing system regarding load flows, voltage levels, and short circuit levels. Review the system performance with and without the proposed projects.
- iii. In furtherance to the system studies above, the consultant shall identify the system requirements for the transmission network in rural areas to ensure reliable electricity supply with expected demand growth, using three load demand scenarios – 2027, 2030, and 2035.
- iv. Review the updated ADB Safeguard Policy Statement (2009) and all relevant guidance notes along with government policies, rules, and acts.
- v. Describe the alternative analysis procedure for framework and carry out alternative analysis of transmission line right of way (RoW) and optimal substation location and suggest the preferred alternative from the Environment and social resettlement safeguards perspective. The analysis will propose at least 03 (three) alternative routes for each TL line and optimal substation locations. Conduct a comparative analysis and recommend the best suitable route considering optimum cost, complexity, and minimum environmental impact.
- vi. The analysis shall also determine the potential financial, social and environmental implications/scoping of the proposed system. This shall also include detailed technical, economic, and financial analyses, and also environmental, and social resettlement safeguards assessments with related assumptions.

- vii. Prepare project cost estimation showing foreign and local costs of all the major items and spread them over the implementation period of the project.
- viii. Visit the sites for existing/planned/proposed substations, analyze available drawings, and determine technical particulars of relevance for preparing technical specifications of the equipment to be procured.
- ix. Perform sensitivity analysis for both Financial and Economic considerations and recommend the best Financial and Economic model for the project.
- x. Prepare a procurement plan and recommend contract packages considering market potential and geographical location; prepare an implementation schedule in the form of a bar chart for each contract package and show various activities and their duration.
- xi. Prepare a standard and quality report acceptable for funding institutions, summarizing findings and recommendations with a generic description of the various features of the program, outlining technical and financial considerations, ranking the various program components as per economic merits and performance targets of reducing transmission losses and specified voltage range in targeted areas of the network.
- xii. Consider and analyze the possibility of obtaining carbon credits from the energy supply and efficiency improvement projects, to enable design and development accordingly.
- xiii. Comprehensive Reports on Initial Environmental Examination (IEE), Environmental Impact Assessment (EIA), Resettlement Plan (RP) and Indigenous Peoples Plan (IPP) and any other reports (if required) according to the latest ADB Safeguard Policy Statement (2009).
- xiv. Topographic survey report, sub-soil investigation report, pre-section measurement of existing ground level and highest flood level, and nearest public road level are needed for calculating the probable cost of the foundation, landfilling quantity, slope protection, or retaining wall issue. Recommendation about surface drainage system (especially discharge of water from the substation area to outfall point) is needed for effective discharge of rainwater from sub-station area.

3. Scope of Works:

The rationale behind the project is to expand the reliable transmission system of the project area to cater to future electricity demand and to promote clean energy growth. This project aims to strengthen and contribute to efficient power transmission in rural areas and eliminate the existing bottlenecks in power supply to the consumers.

The Consultant shall undertake investigations to assess the technical and economic justification of the planned transmission system expansion and provide the feasibility study report according to the Government Prescribed format which shall also encompass the following services:

3.1 Brief review of the context of the power sub-sector in project areas

Brief review and update of the power sector information with its characteristics including power plants, transmission and distribution network expansion, electricity supply and consumption patterns, load forecast, power system losses, availability of transmission and distribution network,

amount of power cut both transmission & distribution system, and load shedding; critical review of PGCB's load growth forecast in the project area.

3.2 Assessment of the power sector in the project areas: network analysis

The assessment shall be conducted based on the existing Load flow calculations which are undertaken by the PGCB. Owing to the volatility of such information, the load flow calculation shall be updated with current data in PSS/E model and cover a time frame of up to the year 2035 (including a short circuit calculation) of the project area. PGCB shall contribute to such services by providing PSSE software-related support in coordination with the consultant. The Consultant shall make observations on the load flow and short circuit calculation. The Consultant shall also analyze the needs for possible network compensation measures taking software assistance from PGCB.

3.3 Finalizing the scopes of the projects and specifications

Identification of the requirements of the components for the transmission network in the rural areas concerning the projected scopes to fulfill the client requirements. The consultant shall finalize the scope of the project and identify the project locations and components through detailed technical, financial, environmental and social resettlement safeguards studies and other necessary assessments. Accordingly, the consultant shall propose detailed technical specifications for the final scope of the project based on the required feasibility studies and due diligence. In this regard, PGCB shall provide the existing standard technical specifications of equipment used in its bid documents under the previous similar power transmission projects.

3.4 Assessment of expected benefits on the socio-economic situation of the populations in the project areas

Based on the review of the power supply and the load/demand forecasts in the targeted project Area as well as the network analysis, the Consultant shall assess the beneficiaries of the project and the potential benefits of the program measures to the beneficiary target group in the Project Area.

The assessment should be based on a baseline (business as usual scenario) and a scenario in which the program is implemented as planned. By comparison of the scenarios, the Consultant shall assess the effects on economic development in the region, poverty reduction, and improvement of livelihoods via an improved energy supply on a household level and agricultural development via improved operation of irrigation pumps and husking machines.

Benefits of the program shall be quantified where feasible and reasonable (such as the number of new customers connections that are facilitated by the increased transmission capacity, the number of households benefitting from the improved electricity supply, the percentage of households in rural areas benefitting from the improved supply, and if data is available, the number of females led customers/households).

The consultant shall include findings on the following aspects concerning the project in the submitted report- Population coverage, Population disaggregated data by women, senior citizens, children, physically and mentally challenged, etc.,

The effect/ impact, adaptation, and specific mitigation measures thereof if any on 1) Gender, women, children, persons with special needs, excluded groups, etc., 2) Employment, 3) Poverty Situation, 4) Regional Disparities, 5) Gender-Related issues shall be included in the report.

3.5 Preliminary transmission line route identification

Preliminary transmission line route identification in sufficient detail shall be conducted in close collaboration with PGCB as a basis to estimate its cost. The transmission line routes are those indicated in the scope of work of the project identified based on the study. Electricity Act-2018 and Electricity Rules-2020 and subsequent amendments should be followed to find out the tower footing compensation requirement.

Drone-based aerial survey data for all three routes shall be provided by the Consultant. Transmission Line Cost estimates shall not be done based on a per km cost basis. For cost estimate, preliminary plan, profile (preferably in PLSCAD), and tower schedule shall be prepared by the consultant for best route to determine required tower extensions and other necessary parameters. All the river crossings of the line shall be thoroughly studied by the Consultant to find out any special requirements for the route. All the railway, road, metro and highway crossings of the line shall be thoroughly studied by the Consultant to find out the necessary need for road-cutting permissions, and any special requirement for the route taking into consideration of the statutory clearances to be maintained.

The consultant shall prepare a location-wise length breakdown of the proposed three routes for each transmission line in a tabular format with the locations segregated into respective divisions, districts, and upazila, including the tentative requirements of road-cutting permissions required for each section.

A detailed line route survey shall be conducted as per the requirement of **Attachment-4**.

3.6 Preliminary survey of substation areas

In coordination with PGCB, the Consultant shall propose new substation locations. Therefore, site visits shall be conducted to each of the project areas requiring the selection of new land. Before the site visit, the Consultant shall acquaint himself, in consultation with PGCB with the usual procedures of land acquisition in Bangladesh for the project purposes. It shall be kept in mind that all documentation that will be part of this Feasibility Study to be used by PGCB in the process of land acquisition.

A detailed substation survey shall be conducted as per the requirement of **Attachment-3**.

3.7 Layout and design on feasibility level for the transmission lines, construction of new substations, extension of existing substations

Line Optimization and Tower Spotting

Within the Feasibility Study, the Consultant shall propose a layout of the transmission line based on configuration, type and size of the conductor, and tower design. Current standard designs for transmission lines within PGCB shall be scrutinized. The layout shall prove that all line design parameters selected are optimized as far as possible, and further, that various configurations of conductor and tower type, shield wire selection (including the use of OPGW), shielding angle, conductor clearances, and insulation requirements, ground clearance and tower grounding have been considered and analyzed to obtain the least cost solution.

Substation Design

Substation design shall involve the following.

- a) Electrical works
- b) Communications and SCADA
- c) Civil, structural, and architectural works
- d) Access to the area,

a) Electrical Works

Based on the confirmation of the suitability of the substation areas, basic drawings shall be developed for the new substations as well as the extension of existing substations including but not limited to the following:

- Single line diagrams indicating the station arrangement, equipment layout, etc stating the bus scheme voltage level wise, short circuit level.
- Layout drawings including sections and elevations showing, in general, the substation site, line termination positions and requirements, connections to existing facilities if any, bus work and provisions for future expansion, etc.
- Protection, control, and metering drawings shall be developed and shall indicate types of protection, zones of protection and timing requirements, re-closing requirements, signaling and communications requirements, schematic drawings showing the equipment protection to be provided, etc.
- Panel arrangements in the control room and extensions to the room, electrical auxiliaries, DC batteries or extensions of DC battery banks, etc.
- Provision of necessary RTUs to allow integration of the substations into PGCB's remote control system.

The level of detail to be shown on the drawings shall be sufficient to allow the determination of required equipment for further use during the preparation of Tender Documents.

b) Communications and SCADA

Communication and SCADA systems shall be provided for the new substations that shall have proper compatibility with the NLDC. Amongst others, the required signaling facilities, data transmission and communication channel requirements, telephone systems, and SCADA facilities shall be considered. Fiber Optical Communication System based on Optical Ground Wire (OPGW) on the new transmission lines shall be considered.

Concerning the extension of existing substations, the Consultant shall review the existing communication and SCADA system and if found adequate, extend the existing system to cover the new equipment. PLC extension may be more advantageous for the extension of existing substation systems.

In any case, the data transmission shall consider the requirements for the integration of the new or extended network components into the PGCB's NLDC. System compatibility and a description of all control integration work into the NLDC shall be addressed by the Consultant to safeguard the functionality and compatibility with the existing PGCB systems on transmission networks.

c) Civil, structural, and architectural works

Preliminary and tentative layout drawings shall be prepared for all civil, structural engineering, and architectural works and equipment including site improvements, access roads, fencing, drainage, grading, water supply, sewage, and waste disposal, and equipment foundations for the substation

extensions and proposed new substations. If it is deemed necessary, for an extension of the control building or/and room in the existing substations, the Consultant shall prepare the design and drawings for the extension works.

General foundation requirements and structure outlines shall also be indicated on the drawings. Particular interest shall be given to the water drainage system. Due to the prevailing climatic conditions, excessive rainfall or flood water needs to be evacuated. The civil works substation design on a feasibility study level shall take into account that requirement. Rainwater harvesting and installation of rooftop solar panels shall be taken into consideration while preparing the layout. The level of detail to be shown on the drawings shall be sufficient to allow for the determination of the scope of works by a contractor.

For substations, the following information is needed to be included in the feasibility study report.

- i) Topography survey report of the proposed substation area;
- ii) Sub-soil investigation report;
- iii) Location of approach road;
- iv) Recommendation about culvert requirement in the approach road;
- v) Pre-section measurement data of existing ground level;
- vi) Nearest public road level;
- vii) Highest flood level (HFL) of that area and
- viii) Recommendation about surface drainage system (especially discharge of water from the substation area to outfall point).

d) Site access

Access roads to the substations site are very important, especially for transportation and installation of heavyweight equipment such as Power transformers and other HV equipment. The Consultant shall bear these aspects in mind when studying the project.

3.8 Capability Statement Related to Training Aspects

PGCB operates a countrywide network of transmission lines and substations. The Consultant shall investigate, in collaboration with PGCB, potential needs in training covering technical particularities of transmission network planning, design, operation & maintenance. Tentative training measures especially for specific training on future challenges of PGCB (Example: Substation's GIS equipment maintenance, Underground Cable maintenance,.) to deal with high voltage systems.

3.9 Cost estimate, economic and financial analysis

Cost estimates

The project cost is classified into revenue expenditures, capital expenditures (electrical material, electrical installation, etc.), and contingencies. The consultant shall prepare a detailed cost estimate of the project which shall include the following-

- i. Cost for each transmission line, substation, bay extension, reconductoring and any other components shall be presented in a tabular format, along with unit, unit cost and quantity, segregated into foreign and local currencies, mentioning the costs of electrical material, installation, land development, civil works, boundary/retaining wall (if necessary),

- compensation for transmission line and AIT, CD-VAT, road cutting related costs including but not limited to HDD.
- ii. Land Development cost shall include slope protection cost (if required) which must be mentioned in the report. Landfilling depth, amount of filling, unit cost, and type of compaction needed must be mentioned for each substation/ bay extension. Calculations for estimating land development costs shall be presented in the report.
 - iii. Consultant shall identify whether a retaining wall is necessary for any substation and provide rate, quantity, and cost where necessary. Calculations for estimating retaining wall cost shall be presented in the report.
 - iv. Consultant shall identify whether land acquisition and development are required for any bay extension. For estimating land development, slope protection and retaining wall costs, the consultant shall mention approved rate schedule as a reference.
 - v. The consultant shall estimate Customs Duty, and VAT expenditures.
 - vi. The consultant shall estimate the price and physical contingencies of the project mentioning the assumptions used.
 - vii. For estimating the cost of transmission line, consultant shall mention whether the line route falls in a wind zone and whether the line goes through water bodies. In that case, appropriate factors and relevant wind speeds and river crossing distances should be cited along with several river bed towers, anchor towers, spans etc.
 - viii. Consultant shall present the Resettlement Budget for each transmission line, substation and bay extension (if necessary), in a tabular format which shall be segregated into Land Acquisition for substation/ bay extension, Compensation for tower footing, Compensation for crops and trees, other various forms of compensation along with necessary administrative costs.
 - ix. Consultant shall present the environmental safeguards budget for each transmission line, substations and bay extension, if any for corrective action if there are any damage to the project areas.
 - x. The amount of land which will be acquired for each substation/ bay extension must be mentioned. Calculations for estimating the land acquisition cost for each substation/ bay extension must be presented along with necessary documents obtained from local land administration offices.
 - xi. For estimating compensation for tower footing area, consultant shall present the calculation for each transmission line along with necessary documents obtained from local land administration offices. The consultant must mention the total tower footing area along with several towers for each transmission line separately.
 - xii. The Consultant shall provide a detailed cost breakup for consultancy services (if required) along with Terms of Reference, consultant team composition, specialist and staff man-month requirement, rate of service of individual team members and reimbursable expenses for each service.
 - xiii. The consultant shall provide manpower and overhead cost.
 - xiv. The consultant shall present a tabular cost estimate of the total project segregated into local and foreign currency mentioning the costs of each component separately.
 - xv. The consultant shall present the total foreign currency cost of the project in both BDT and USD along with currency conversion rate.
 - xvi. For estimating transmission line, substation and bay extension costs, the consultant shall consider current and future economic and market conditions (inflation, fuel cost, LME etc.) which shall be mentioned in the study report.
 - xvii. The consultant shall mention site office rent for each project location.

- xviii. Consultant shall mention the gas and fuel cost which will be required for official works and monitoring the site works by the project management setup over the project life.
- xix. The Consultant shall prepare a location wise cost breakdown of the total project in a tabular format with the locations segregated into respective divisions, district, upazila. Similarly, for each transmission line and substation component consultant shall prepare a location wise cost breakdown.
- xx. Amortization Schedule for repayment of loan taken from Government/ Development Partner shall be included in the report.

3.10 Economic and financial analysis

The financial and economic performance of the project shall be assessed over the economic life of the assets. Benefits and costs over time will be projected and compared with a scenario arising if the present situation would continue i.e., current and future customers supplied either through the existing transmission system, as far as still possible, or through additional network components, thus identifying the profitability of the project.

Based on the projections, following indicators will be calculated and assessed using a 12% discount rate:

- Economic Net Present Value (ENPV), Economic Internal Rate of Return (EIRR) and Economic Benefit Cost Ratio (EBCR).
- The economic analysis may consider the benefits of avoidance of CO² due to reduced transmission and distribution losses and also the cost of unserved energy.
- Financial Net Present Value (FNPV), Financial Internal Rate of Return (FIRR) and Financial Benefit Cost Ratio (FBCR)
- Dynamic unit costs of energy transmitted.
- Weighted average cost of capital (WACC) calculation of the project.

Discounted Cash Flow (DCF) method should be implemented with incremental costs and benefits of the project. Operation and Maintenance (O&M) costs of substations and transmission lines over the years after the completion of the project should be presented with valid references in the Life-Cycle Cost analysis. A sensitivity analysis shall be conducted for high or low load growth, a variation in capital costs, and changes in wheeling charges.

In the analysis, year-wise load flow, benefit, investment and maintenance cost in local and foreign currency shall be presented in a tabular format. Border Price Factor, Standard Conversion Factor, Shadow Exchange Rate, Traded & Non-traded inputs/ outputs, and Willingness to pay shall be considered and explained in detail in the report with valid reference. All assumptions which are relevant to the analysis shall be included in the report. The consultant shall attach necessary documents if necessary. The report should include a sensitivity analysis for economic and financial analysis.

3.11 Market Study Report

The objective of market research and analysis is to develop an appropriate understanding of the market sectors that have been identified as having the potential to bid for the goods, services, and/or works required for a contract within a Project. The Consultant should explain how a market works and how this impacts the Client's approach to the market. It should look at the market from

both the perspective of the Client and suppliers operating in that market, simply to determine, what will motivate the right suppliers to participate in the procurement.

The market analysis will include:

- Market capability to meet the Client's needs, including typical experience levels, package sizes, and financial performance. If the market analysis requires early market engagement, this deliverable will provide inputs into the Market Engagement Strategy.
- Previous experience in the market by the Borrower and other customers, including ADB and non-ADB projects as appropriate.
- Market view of the Client (from a supplier's perspective) in terms of attractiveness for contracting with (e.g., reliability of payment, procurement capability, complaints handling) i.e., are they likely to bid Noting, in some Bank procurements no suppliers bid, or indeed possibly only one may bid due to either concern about capacity and/or onerous conditions imposed.
- Modification of requirements (if needed) to align it to the market's capability or influence the marketplace so that it is willing and able to meet the requirements.
- Current practice procuring from the market includes pricing methods, risk allocation, and performance and cost benchmarks.

3.12 Expected Outcome of Study

The services for Feasibility Study, Topographic survey, Route Survey and IEE, EIA, RP, IPP and/or other documents needed according to the ADB's Safeguard Policy Statement as required under this contract may be described as follows and a consultant will maintain all liaisons with DOE (Department of Environment) of PGCB for getting necessary clearance of the project.

In that context, the scope of proposed consultant services includes more specifically the following:

- i. Feasibility Study shall be submitted as per the attached format (Attachment-2) prescribed by the Planning Commission. Services mentioned in ToR shall be included in the report as Additional Chapters if not mentioned in Attachment 2.
- ii. Topographic survey report shall be submitted as per the attached format (Attachment-3)
- iii. Route Survey report shall be submitted as per the attached format (Attachment-4)
- iv. Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) report shall be submitted as per the directives mentioned according to the Safeguard Requirements 1: Environment of ADB Safeguard Policy Statement (2009) and the attached format (Attachment-5). Bengali Translation of Executive Summary of IEE and EIA Report shall also be submitted.
- v. Resettlement Plan shall be submitted by following the ADB Safeguard Requirements 2: Involuntary Resettlement (ADB SPS 2009), Electricity Act-2018, Electricity Rules-2020 and Acquisition and Requisition of Immovable Property Act-2017 (ARIPA 2017) as per the attached format (Attachment-5). Bengali Translation of Executive Summary of RP Report shall also be submitted.
- vi. Indigenous Peoples Plan (IPP) shall be submitted if required according to the Safeguard Requirements 3: Indigenous Peoples.

- vii. Any other reports (if required) according to the latest ADB Safeguard Policy Statement.

3.13 Contribution of PGCB

PGCB shall provide all existing information, data, reports, and maps as far as available and will provide the Consultant administrative support in obtaining any other relevant information and materials from governmental institutions and state authorities as far as possible based on practical situations.

PGCB shall assist the consultant in performing load flow and short circuit study software-related analysis. PGCB will provide the necessary load flow diagram of PSSE software-based analysis and other relevant tabular output. The consultant shall analyze the load flow diagram and other software outputs. Consultants will incorporate findings for the analysis on their responsibility and also provide recommendations based on study results. Consultant shall provide necessary input information for the analysis as per PGCB requirement. The input information consists of the demand forecast of the new and neighboring substations and transmission line information of the target project.

However, the Consultant must check the availability, quality, and suitability of this information. The information, data, reports, etc. as mentioned above will be available for the Consultant's unlimited use during the execution of the proposed services. Due provision shall be made in the Consultant's bid to enable him to procure maps, meteorological and geological data, and any other information he considered necessary for the proper completion of this assignment. The provisions should be adequate to enable him to carry out the procurement of this information at his own cost.

In general, PGCB will provide administrative support to facilitate all staff permits, authorizations, and licenses required for the performance of the Consultant's services in Bangladesh. PGCB will also provide administrative support to assist the Consultant in customs clearance of all equipment, materials, and personal effects to be imported (and re-exported upon completion of his assignment) for the study.

PGCB will nominate for Feasibility Study a member of his staff as Project Director or Liaison Officer with the Consultant. It will be the Consultant's duty to maintain close contact with him on all aspects of work. As a matter of principle, all formal communications relating to the work will be directed to the attention of the Liaison Officer.

3.14 Consultant needs to Incorporate ‘Green and Climate Resilient Development (GCRD)’ Related Chapter in Feasibility Study and IEE/EIA Report (highlighting project scope and associated areas).

The Green and Climate Resilient (GCR) in public investment will aim at an affordable, realistic and adaptable framework to make quantifiable progress in targeted sectors to simultaneously ensure sustainability, efficiency and resilience throughout the development pathway. Additionally, the GCR solutions will ensure that nobody is left behind, creating opportunities to reduce disparities and help excluded groups realize a fair share of benefits. It implies that

natural resources and environmental services can sustainably fulfill their full economic potential. The fundamental pillars of the GCR are stated below-

i) Green-

- Sustainability- Environmental, socioeconomic, and financial sustainability hinge on promoting development through initiatives that eliminate/reduce the adverse effects of activities that threaten growth. This also implies that countries must become better stewards of their renewable and non-renewable resources to prevent overuse, pollution, and irreversible climate consequences.
- Efficiency- To spend better and use better, there is a need to maximize output (in terms of returns to society) per unit of cost, including those that are financial, social, and environmental. Better spending can deliver the infrastructure and services that countries need, creating more competitive cities. The productive use of agricultural lands, fisheries, forests, and other natural resources is key to achieving prosperity and improving lives.

ii) Climate resilience- Public and private sectors need to prepare for, mitigate, and adapt to a wide range of risks and uncertainties associated with climate change. Resilience allows countries to continue to grow instead of diverting resources to multiple recovery efforts.

The following issues/scopes have to be addressed regarding incorporating GCR for the particular project (justification as per project scopes) with proper relevancy (not limited to):-

- Transmission and distribution extension and upgrades for fortifying grid infrastructure (e.g., substations, transformers, high voltage lines, medium or low voltage lines, metering, and associated components).
- Implementation of Montreal Protocol targets for phasing down fluorinated gases (F-gases).
- Ecological Restoration of natural reservoirs and water bodies (natural habitats) with their biodiversity conservation.
- Excavation of local water reservoirs (canals, ponds, and baors) for enhanced water storage
- Smart dredging activities for all rivers and wetlands to maintain flow and transport as well as accommodate and smooth drainage of excess floods during climate-induced extreme events.
- Community-based afforestation and reforestation, wetland & watershed management, and agricultural landscape management, for biodiversity conservation, enhancement of ecosystem resilience, and increasing carbon sequestration.
- Increase tree coverage from 22% to 25% by 2030. Develop a proper tree plantation plan for the associated project.
- Identification of scope for establishment of climate resilient health care facilities in urban areas (project areas).
- Sustainable waste management and reduction of pollution (e.g., air-water pollution) in urban and rural areas (project areas).

- Highlighting scopes for ecological restoration associated with project areas and during project implementation following 3R (reuse, reduce, recycle) based waste management also.
- Scopes for addressing spatial planning and flood hazard zoning-based issues for project area identification and implementation.
- Construction and rehabilitation of gender, elderly, and disability-sensitive multi-purpose and climate-resilient accessible cyclone and flood shelters with safe drinking water, sanitation, and livestock shelter facilities.
- Expand coverage of social protection to support women with childcare services and support services for gender-based violence (GBV) survivors.
- Climate inclusive planning and budgeting (integration of climate finance into DPP format).

3.15 Log Frame

The analysis shall also determine the input & output of the project. Detailed Log Frame as per DPP format containing direct relation of output with the Objectives and Goals of the project. Each item in the LF should contain a Narrative Summary (NS), Objectively Verifiable Indicators (OVI), Means of Verification (MOV), and Important Assumptions (IA).

Tentative project components are attached (Attachment-1)

4. Draft project execution and time frame, draft procurement plan

4.0 Tentative Implementation and Procurement Plan

Considering the geographical separation, technical characteristics of equipment and works packages, and expected foreign currency of different procurement packages, the Consultant shall draft a tentative procurement/tendering plan indicating project components regrouped into lots or packages. The Consultant shall identify the major contracts. Procurement packaging, including contract lots, is designed to align with the target market; geographical locations and technical characteristics are important to reduce unavoidable risks associated with the logistical setup of project implementation.

A tentative detailed schedule related to the project execution shall be presented within the Feasibility Study.

4.1 Identification of potential risks during project implementation

Procurement risk analysis is the process of identifying and minimizing the likelihood of a risk occurring and minimizing the impact on the Client's Project Objective if the risk does occur. The Consultant shall create the Risk Management Plan by summarizing and recording the overall risk management analysis. To make the identification and analysis of procurement risk manageable, the Consultant should structure the assessment around eight (8) key areas, which are:

- i. Market complexity and competitiveness;
- ii. Delivery and supply security;
- iii. Suppliers and supplier relationships;
- iv. Borrower experience, capacity and capability;
- v. Cost trends;
- vi. Technical innovation – the degree and rate of change;
- vii. Sustainability (environmental, economic, social); and
- viii. Business and operating environment.

5. Duration:

The engineering consulting services and safeguard documentation shall be completed within 07 months from the signing of the contract.

6. Preparation and Submission of Report and Documentation

The Consultant has to prepare the following reports/documents:

- i. **Consultant shall generate a separate report for Feasibility Study, Topographic survey, Route Survey, IEE, EIA, RP & IPP, and any other reports (if required) according to the ADB SPS (2009).**
- ii. **Inception Report:** It should describe detailing the work plan, expected problems in the implementation of the study if any, a review of the available power sector information, and the power supply situation encountered in the project area. The firm shall submit the **Inception Report** in hard Copy (Three copies) and soft copy / Digital format (One copy) within 15(fifteen) days after the commencement of services.
- iii. **Interim Report:** 1.5 months after commencement of services in five copies; the report shall summarize the technical, financial, and economic findings of the conception works, in particular the results of the tasks mentioned in 3.0.
- iv. **Draft IEE:** The draft IEE, reports according to the updated ADB Safeguard Policy Statement (2009) need to be submitted within 04 (five) months.
- v. **Draft Topographic survey, Route Survey, EIA, RP, and IPP:** The draft EIA, RP, IPP and/or additional reports (if required according to the updated ADB Safeguard Policy Statement (2009)) need to be submitted within 04 (four) months. The firm shall submit a draft Topographic survey, Route Survey, **reporting** hard Copy (Three copies), and soft copy/ Digital format (One copy) within 04 (four) months from the effectiveness of the contract. The draft Topographic survey & Route Survey drawings shall be made in standard sizes such as A3.
- vi. **Draft Feasibility Study:** The firm shall submit a draft feasibility study **report** in hard Copy (Three copies) and soft copy/ Digital format (One copy) within 05 (five) months from the

effectiveness of the contract. The firm shall also deliver a presentation on Draft Feasibility Report and all other submitted Draft Reports.

- vii. **Final IEE Study:** The firm shall submit a draft feasibility study **report** in hard Copy (Three copies) and soft copy/ Digital format (One copy) within 06 (six) months from the effectiveness of the contract.
- viii. **Final Feasibility Study:** The firm shall submit the final feasibility Study report in hard Copy (five copies) and soft copy/ Digital format (One copy) within 06 (six) months from the effectiveness of the contract. This final report will accommodate necessary refinement to incorporate comments/ observations from PGCB.
- ix. **Final Topographic survey, Route Survey, EIA, RP, IPP:** Firm shall submit the final Topographic survey, Route Survey, EIA, RP, and IPP **report** and/or additional reports if required according to the latest ADB Safeguard Policy Statement (2009) in hard Copy (five copies) and soft copy/ Digital format (One copy) within 07 (seven) months from the effectiveness of the contract. The final Topographic survey & Route Survey drawings shall be made in standard sizes such as A3.

7. Payment Schedule

Sl. no	Milestones (Submission and acceptance of reports under Scope of Services)	Payment (% of the contract price)	Cumulative (% of the of respective item price)	Remarks
i.	Contract Signing	-	-	-
ii.	Inception Report (Feasibility Study Reports)	0%		Payments against the draft reports shall be paid after comments on the draft reports are provided by PGCB. All reports should be approved by PGCB and ADB. Final bill shall be paid after reports are accepted by PGCB.
iii.	Interim Feasibility Study Report	10% of Feasibility Study Report		
iv.	Draft Topographic survey, Route Survey, IEE, EIA, RP, IPP	40% of Respective Item		
v.	Draft Feasibility Study Report and Presentation on Draft Feasibility Report and other Draft Reports	30% of Feasibility Study Report		
vi.	Final Topographic survey, Route Survey, RP, IPP	60% Respective Item	40%+60% = 100%	
vii.	Final Feasibility Study Report	60% Respective Item	10%+30%+60% = 100%	
viii.	Final IEE report	50% of Respective item		
ix.	DoE Clearance (If needed)	10% of IEE& EIA report	40%+50%+10% = 100%	

8. Expertise requirement:

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

Key Experts	Qualification	Minimum Experience
Team Leader/ Project Manager	M.Sc. in Electrical/Power Engineering	Team Leader shall at least have twenty (20) years of professional experience in the related field. Must have experience in a multidisciplinary team conducting Feasibility Studies, Topographic surveys, Route Survey, IEE/ESIA & RP in power sector projects. Experience in leading a consultants' team as Project Manager or Deputy Project Manager: 5 projects (at least two as PM) with at least two (2) projects outside home country. Experience working in ADB-funded Projects and familiarity with ADB's latest policies is desirable. Excellent knowledge of English language for coordination and technical report writing skills;
Power System Analyst	B. Sc. in Electrical Engineering	Must have at least 10 years of experience in the relevant Field out of which at least two (2) years of experience as a consultant engineer for 132kV or above voltage level in power system planning and analysis. Proven experience and proficiency in using power system transmission planning simulation software and preferably PSS/E are mandatory. Excellent knowledge of the English language for coordination and technical report-writing skills.
Sub-station Engineer	B. Sc. in Electrical Engineering	Must have at least 10 years of experience in the relevant field out of which at least five (5) years of experience as a consultant engineer for 132kV or above voltage GIS and AIS substation designing and implementation projects and at least 03(three) projects experience to work as a consultant engineer for the high voltage substation designing project outside home country. Should be fluent in the English language for day-to-day communication.
Sub-station Engineer	B. Sc. in Electrical Engineering	Must have at least 10 years of experience in the relevant field out of which at least five (5) years of experience for 132kV or above voltage GIS and AIS substation designing and implementation projects. Should be fluent in the English language for day-to-day communication.

Key Experts		Qualification	Minimum Experience
Transmission Engineer	Line	B. Sc. in Civil/ Mechanical/Electrical Engineering	Must have at least 10 years of experience in the relevant field out of which at least five (5) years of experience as a consultant engineer for 132kV or above voltage transmission line designing and implementation projects and at least 03(three) projects experience as a consultant engineer for transmission line designing and implementation project outside home country. Should be fluent in the English language for day-to-day communication.
Transmission Engineer	Line	B. Sc. in Civil/ Mechanical/Electrical Engineering	Must have at least 10 years of experience in the relevant field out of which at least five (5) years of experience for 132kV or above voltage transmission line designing and implementation projects. Should be fluent in the English language for day-to-day communication.
Civil Engineer (Transmission Line & Substation)	Engineer Line & Substation	B. Sc. in Civil Engineering	He must have at least 10 years of experience in the relevant field out of which at least five (5) years of experience as a consultant engineer for designing and implementing 132kV or above voltage transmission line & substation projects and at least two (2) projects experience as a consultant engineer for transmission line & substation project outside home country. Should be fluent in the English language for day-to-day communication.
Civil Engineer (Transmission Line & Substation)	Engineer Line & Substation	B. Sc. in Civil Engineering	Must have at least 10 years of experience in the relevant field out of which at least five (5) years of experience for designing and implementing 132kV or above voltage transmission line & substation projects Should be fluent in the English language for day-to-day communication.
Route Survey Expert		Bachelor's Degree in Civil Engineering/ Urban & Regional Planning	10 years of total Experience in conducting Route surveys, land surveys, and GIS Mapping. He/She shall have practical experience in conducting route surveys of at least 3 no's Projects (Minimum 500 km) of 132 kV and above High Voltage transmission system. Must have good communication skills, acquainted with the technical terminology of the survey.

Key Experts	Qualification	Minimum Experience
Environmental Expert	Master's Degree in Environmental Science or Equivalent	He/ She must have a Master's Degree in Environment Science/ Environmental Engineering / Environmental Management /Natural Resource Management /Biology/ Zoology/ Botany/Ecology with a Total of 15 years of Experience in related areas and shall have additional experience in OHS management in Projects. He /She shall have practical experience in conducting feasibility Study and IEE/ESIA in at least 5 nos. Projects in the power sector of which at least two High Voltage Transmission Line Projects as an Environmental Expert. Certification in Health & Safety and experience of working in ADB funded Projects and familiarity with ADB's latest policies is desirable.
Social Development and Gender Expert	Master's Degree in social science or gender studies or related studies	He/ She must have more than ten (10) years of professional experience in the related field. The expert shall have intensive experience in preparation of GAP, SEA/SH prevention plan, LMP, SEP or related document. The professional shall have experience in similar studies of the Power Sector related projects (preferably in high voltage transmission line projects). Experience of working in ADB funded Projects and familiarity with ADB's latest policies is desirable.
Socio-Economist/ Resettlement Expert	Master's Degree in Economics/ Sociology	He/ She must have at least ten (10) years of professional experience in the related field. He /She shall have practical experience in conducting RAP, RPF, SEPetc at least 5 nos. Projects in the power sector /High Voltage Transmission Line Projects as Socio-Economist/ Resettlement Expert. The expert is desired to have experience in works related to the preparation of the Stakeholder Engagement Plan as per ADB's guidelines. The Consultant is required to maintain regular liaison with DC office regarding Land Acquisition and Crop Compensation
Biodiversity Expert	Master's Degree in Botany/ Zoology	He/ She must have a Master's Degree in Biology/ Zoology/ Botany/Ecology with more than 05 years of professional experience in works related to biodiversity studies in Transmission Line Projects.
Agronomist	Master's Degree in Agriculture/ Soil Science/ Geology/ Geography	He/ She must have a Master's Degree on Agriculture/ Soil Science or relevant subjects with experience of over 05 years on soil and tissue analysis and interpretation.

Key Experts	Qualification	Minimum Experience
Water Resources Specialist	Master's Degree on Water Resources Engineering/ Hydrology/ Geology	He/ She must have a Master's Degree in Water Resources Engineering/ Hydrogeology or relevant subjects with more than 05 years of experience in hydrologic, hydraulic, or water quality modeling.
Financial Expert	MBA/ Master's Degree in Finance Major	10 years of professional experience. He /She shall have practical experience in conducting at least 5 nos. Projects in the power sector /High Voltage Transmission Line Projects as Financial Expert.

The Consultant may add personnel to their required staffing pool to accomplish the assignments, but they will not be accounted for evaluation.