

Terms of Reference (ToR)
for
Appointment of Consulting Firm for Developing New
Business Model and Feasibility Study in Allocated Sites for
Wind Power Generation

1. Project Background

Bangladesh is situated between 20°34'-26°38' North Latitude and 88°01'-92°41' East Longitude. The country has a 724 km long coastline and many small islands in the Bay of Bengal, where strong south-westerly trade wind and sea breeze blow in the summer months and there is gentle north-easterly trade wind and land breeze in winter months. The long-term wind flow, especially in the islands and the southern coastal belt of Bangladesh indicate the opportunity of wind power generation in islands and coastal areas of this country.

In line with the Bangladesh government's Renewable Energy Policy targets, government has adopted various programs to generate 10% of total power generation from renewable energy resources by 2021. To meet this target 3100 MW renewable energy based power generation plan has been prepared. Out of which about 1370 MW is targeted from wind energy. The power sector utilities/companies will generate 600 MW of wind power and 770 MW will be generated by the Private sector initiatives.

Bangladesh government has conducted extensive Wind Resource Mapping program under a TA project with the support from USAID. Under these TA projects, Wind Resource Assessment have been accomplished successfully at Inani, Parky beach, Sitakunda, Mongla, Lalpur, Jaforabad, Badargonj, Mymenshingh and Madhupur. Govt. now intends to conduct a detail feasibility study of two potential sites for installing wind power plants.

With this end, Power Division, Ministry of Power, Energy and Mineral Resources intends to appoint Consulting firm to conduct a feasibility study of two potential sites (to be identified by a team of individual consultants and will be specified in the RFP) for installing wind power plants. The project expenditure will be borne from the fund of the Asian Development Bank.

2. Purpose of the Assignment

The main objectives of this assignment are:

- a) To assess the potential of wind energy at site;
- b) To assist utilities in developing RE based power generation projects;
- c) To attract investment in wind power sector;
- d) To develop business model for the wind projects;
- e) To popularize wind energy technology in the country;
- f) To increase share of RE in the generation mix.

3. Duration and Location of the Services

The duration of the assignment is 06 (six) months.. The location of service will be Bangladesh.

4. Scope of Services

The scope of services includes the followings (including modifications proposed by the consultant, if any) in the scope of work to meet the objectives of the assignments.

- **Review previous studies**

Review previous studies on wind resources assessment & pre-feasibility study report on wind parks at two sites (To be mentioned in RFP)

- **Data Collection**

The consultant will collect data from the “Wind Resource Mapping” project of Power Division or from the authentic organizations with prior consent from the Client. The consultant will also collect secondary data from established sources.

- **Identify potentials**

Identify potentials of the sites for wind power generation base on primary and secondary data.

- **Plant Capacity**

Depending on the land area available, recommend the plant capacity based on wind data from “Wind Resource Mapping” project of Power Division and other established sources. The consultant will determine the optimum height of wind turbines and their generation capacity. Data collection is the responsibility of the consultant. If needed, the consultant will procure data from the authentic organization with prior consent from the Client.

- **Method of Implementation of the Project**

Recommend the method of implementation of the project (public/private) considering economical, financial, commercial aspect. The consultant will prepare model contract document and tender document reviewing the existing documents (Tender document, PPA, IA, LA etc.) for private sector projects and tender document for public sector projects.

- **Power Evacuation**

Recommend on the method of power evacuation and the necessary agreement required with concerned utilities/PGCB. Identify key issues and provide solutions/recommendations for grid stability to the utility to accommodate and integrate the wind power generated from the proposed plants. Identify additional investments and its cost estimates required for successful integration of the wind park. Study the existing power system and identify gaps, load centers to ensure that the renewable energy generated is fully utilized without any curtailment.

- **Applicable Technology**

Review the available technology in the market and recommend the best technology for the project and fix the efficiency level of the equipment. The consultant will determine the optimum height of wind turbines and their generation capacity. Technology will be selected considering the condition of soil and carrying facilities including road, rail, inland water etc.

- **Civil and Structural design**

The consultant will provide detailed civil and structural design of WTG foundation, control room and all other civil works require for the project.

- **Test Soil Condition**

Carry out soil testing at the sites to assess the soil condition and load bearing capacity and recommend the kind of foundation required for the installation of windmill/turbines for the project. The borehole layout plan should be shown in the Digital Topographical survey map in x, y, z Co-ordinate. The 'z' co-ordinate shall be in respect to SOB/PWD BM; Execution of Standard Penetration Test (SPT) at an interval of 1.5m depth with collection of disturbed soil samples upto final depth exploration of each boring; For each bore-hole, minimum depth of boring shall be 20m. If poor quality soil encountered (say SPT value<20) the depth shall be extended upto 30m or more. (Normally SPT is taken @1.5m interval, but SPT must be taken at 1m interval upto top 6m depth); If clayey soil encountered at any depth during boring, undisturbed soil samples must be collected with the help of Shelby tubes.

- **Material carrying**

The consultant will recommend about the carrying facilities including road, rail, inland water etc. The consultant will suggest about the required development of proposed carrying facility including drawing, design and cost estimate.

- **Conduct Morphological, Geotechnical and Topography study of the site**

Conduct detail topographic survey for the proposed area by Total Station (TS) and GPS at a grid of 25m x 25 m with reference to nearby established BM (3-D pillar) Pillar of Survey of Bangladesh (SoB); the topographic survey will cover X,Y, Z (RL) values of each and every Ground Control Point (GCP), structures and any other significant physical features exists above the surface, banklines of water bodies etc.; collect cadastral Mouza Maps (RS Maps) from Land office and to convert them into GIS database by superimposing those with proper geo-spatial reference; prepare Digital Terrain Model (DTM) and Digital Elevation Model (DEM) for the proposed project sites including contour line generation at an interval of 1.0 m and 5.0 m; conduct detail cartographical mapping (on GIS platform) of surveyed data, elevation models (DTM and DEM) with existing land uses, water bodies, cadastral mouza data and so on at a scale of 1:3960 or 1:1980, aiming to demarcate area with geo-reference to cadastral Land documents.

- **Financial & Economic Analysis**

Cost-benefit analysis for different technological options for wind turbine depending on turbine type, mounting options and potential use of electric storage and/or capacitors. Availability, inter-operability, reliability, scalability and maintenance aspects; defining communication, command and control systems, load consumption, system architecture definition and roadmap (including layout, modules, inverters, transformers, meters, etc.), relationship between the features, system output and performance should be taken into account.

The cost estimates for development, construction and operation of the project and predicted revenue, based on the available resource data, as well as indicative quotes or comparison with similar projects.

Financial and economic analysis for the technology suitable for commercial utility-scale grid connected solar power plants at each of the selected sites specifying the investment cost (\$/kW), levelized cost of energy (\$/kWh), subsidies, incentives (e.g. applied to the equipment's costs, etc.), energy tariffs, costs and benefits, total cost of ownership/life-cycle costs of plant, payback time, insurances costs, costs recovery, etc. should be taken into account.

- ***Conduct Flood/cyclone Risk Assessment***

Conduct a flood risk assessment of the site if the site is near a river. Based on secondary flood level data and documentation about flood in the region, the consultant will assess major geological structures in the area and geotechnical conditions likely to be encountered on site. The consultant will also assess the hydrology/hydrogeology of the area and potential risk of flooding as well as historical records or previous investigations, mining/landfill use, possible contamination sources etc.

- ***Cost Estimation***

Finalization of detailed bill of quantity for all aspects of the project including mechanical, civil & electrical works and prepare a detailed breakup of cost estimate of each component of the project.

- ***Environmental, Social, Disaster and RAP Issues***

Review the existing environmental laws and regulations and recommend environmental issues that may arise as a result of the implementation of the project. Conduct assessment of social, disaster and environmental impacts of the project at the selected sites. The assessment shall include an analysis of current formal/informal land use in the project area as well as impacts associated to installation of turbine and connection of the system to the grids. Based on collected data, the environmental impacts and subsequent mitigation and management required should be reflected in the EIA/ESIA report. Disaster impact assessment along with possible mitigation and management requires to be added in the DIA report. Institutional arrangement for environmental, social, disaster monitoring and management for the project should also be reflected in the report. Prepare a full EIA/ESIA, DIA and RAP report as per development partner agencies guidelines;

- ***Legal and Institutional Aspects***

Review legal and institutional aspects of the land, environment and other issues for the proper implementation of the project.

- ***Review Tender Document and PPA***

Review the existing tender document and will prepare a standard tender document for use of generating companies; the firm will also review the existing contract documents (PPA, IA, LA etc.) for private sector projects and will prepare a standard contract documents (PPA, IA, LA etc.).

5. Detailed Outputs of the assignment (and applicable quality standards, where applicable)

5.1 Team Composition and Qualification Requirements for the Key Experts (and Any Other Requirements that Will Be Used for Evaluating the Key Experts under Data Sheet 21.1 of the ITC)

Consulting services are solicited from Renewable Energy Experts experienced in carrying out wind studies and assessing wind based power plant. Consulting firms should have experience to perform consultancy services, experience of similar assignments, experience in similar conditions, firm's capability and availability of appropriate skills among key staff, availability of resources, relevant transactional experience. The proposer is expected to engage the following categories of key experts for the Project and CVs shall be submitted accordingly:

- **Renewable Energy/Wind Energy/ Technical Expert (Team Leader) (Position-1 International, 6 person months):** The Team Leader must have a Bachelor's degree in Engineering or Masters in Renewable Energy or Wind Energy or any other relevant subject with minimum 20 years of experience including minimum 5 years of experience in the field of wind energy technology. He should preferably have experience of carrying out feasibility study of minimum of 50 MW wind plant. The expert should have good command of wind turbine standards and experience on resource assessment and calculation of energy yield for windmill/projects.
- **Power System Specialist (Position-1 National, 6 person months):** The Power System Specialist should have at least a Bachelor's degree in electrical engineering and 15 years of experience in the power sector including in power generation, transmission/distribution network analysis and grid integration of renewable energy-based generation. He should have minimum 5 years of experience in the field of high and medium voltage transmission sector He should have knowledge of integration of wind energy with the national grid as well as stability of the national grid. He should able to estimate cost required for successful integration of the wind power plant.
- **Environmental Expert (Position-1 National, 3 person months):** The environmental expert must have a Master degree in Environmental Science or any related subject. The expert must have a minimum of 5 years of experience in the field of environment.
- **Legal & Institutional Expert (Position-1 National, 3 person months):** The legal expert must have a Masters degree in Law from a recognized institute of higher learning. The expert must have a strong background and experience in Bangladesh law and legislation related to land management, environment conservation and natural resource management. The expert must have a minimum of 5 years of relevant practical experience.
- **Social Specialist (Position-1 International, 3 person months):** The Social Specialist will have at least a Master's Degree in Social Science and at least eight years of relevant work experience in social assessment and land acquisition/resettlement issues in infrastructure projects. Good command of International standards, including development partner agencies safeguard policies, is also required.
- **Civil Engineer (Position-1 National, 3 person months):** He should have at least a Bachelor's degree in Civil engineering and 15 years of experience in the relevant field.

He should have minimum 5 years of experience in civil works including drawing, design, soil investigation, survey etc. The consultant will provide detailed civil and structural design of WTG foundation, control room and all other civil works require for the project. He should able to estimate cost required for all civil works of the wind power plant.

- **Financial/Economic Analyst (Position-1 National, 3 person months):** The Financial/Economic Analyst must have a Masters in Economics/Finance/ Business Administration or any relevant subject with a minimum of 5 years of experience in financial/economic analysis. The specialist shall be able to provide the cost benefit analysis of the project in financial and economic terms. Provide also a basis for wind power development plan for Bangladesh based on the existing available generation and identify the benefits based on price of wind turbine, other material cost, Storage etc.

5.2 Reporting Requirements and Time Schedule for Deliverables

- Inception Report within 1 (one) month after signing of the contract
- Interim Report within 2 (two) months after signing of the contract with the analysis of collected data of wind resources and effective business models.
- Draft Feasibility Study Report within 04 (four) months after signing of the contract with the analysis of data and identification of suitability of sites.
- Hold Stakeholders Consultation Workshop on Draft Feasibility Study Report within 05 (five) months after signing of the contract with the data collection of wind sources, analysis of data and identification of sites.
- Finalization of Feasibility Study Report within 5.5 (five and half) months after signing of the contract with the final analysis of data and identification of suitability of sites.

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

Person to receive the Report: Project Director, Power Division

The consulting firm will report to Project Director, Power Division for billing and contract management. For work execution purposes, the consulting firm will report to the concerned utility company.

5.3 Relevant background information or materials for the assignment: Not applicable

5.4 Indication is downstream work is potentially considered: No downstream work is expected at the end of the feasibility study.

5.5 Training and capacity building requirement: Manpower training: To enrich experience of project personnel and official of Power Division and Power Cell, arrangement for a study tour of approximately 15 personnel in three different countries.

5.6 Equipment procurement: —Not applicable

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

Consultant will work in close association with Project Office, SREDA, Power Cell and other relevant utilities. 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 Project Director.

Logistics Support

Project Office will provide logistic support as far as possible. But office accommodation, site visits, secretarial service will have to be arranged by the consulting firm at their own costs.

(b) Professional and support counterpart personnel will be assigned by Project Director to the Consultant's team

(c) Selection of sites and concerned Utility: The final list of sites and the concerned official under whose guidance the study will be carried out will be mentioned when RFP will be issued.

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.