Onshore Wind Power Projects Installation Guideline

I. Introduction

Bangladesh is one of the most densely populated countries in the world, with more than 160 million people. Approximately 98% of the population has access to electricity (with off grid power solutions), and the price of energy is subsidized. With limited natural gas resources waning and a costly energy subsidy system, the Government of Bangladesh (GOB) is evaluating multiple paths to ensure reliable and affordable power. Under its Power System Master Plan, 2016 Bangladesh set a goal to generate 35% of electricity from coal by 2030. An alternative path being evaluated by the GOB involves identifying, quantifying, and exploiting the country's domestic renewable energy resources to support the 2016 Power System Master Plan's goal of generating 10% of electricity from renewable energy by 2021.

One of the prime challenges to the expanded use of wind and other renewable energy technologies globally is understanding regional renewable energy potential. The variable nature of the wind resource and its strict location dependency impose additional and often new challenges compared with conventional energy technologies.

Recently Sustainable and Renewable Energy Development Authority (SREDA) has started its venture to accomplish the responsibilities imposed by SREDA Act, 2012 (**27. Power to make regulations.** – The Authority may, with the prior approval of the Government, by notification in the official Gazette, make Regulations for carrying out the purposes of this Act). To harness wind energy in an orderly manner SREDA has consulted with stakeholders as well as global energy leaders to formulate a set of installation guidelines to implement land based wind energy projects. This guideline will help project developers to implement the project according to the best practices of wind sector and get a risk free business environment which will ensure availability of resources, proper land use, required transport logistics, quality power dispatch etc.

II. Objective

The objective of these guidelines is to facilitate the development of wind power projects in an efficient, cost effective and environmentally benign manner, taking into consideration the requirements of energy developers/investors to develop a project financeable site and national imperatives.

III. Site Selection and Feasibility *(Details in Exhibit A)*

The process of wind power project development starts with site selection. Identification of suitable sites depends upon land use permission, availability of wind resource, technically and commercially feasible grid connectivity, transport logistics and environmental acceptability. Further, the successful implementation of the site suitability tasks (categorized above) requires de-risking (or mitigating) each by obtaining locally and federally executed contracts, certifications and licenses. SREDA will collaboratively work with Energy Developers to ensure that the above project documents will meet international banking requirements for standard project financings.

- **Land Use Permission:** The Project Developer ("PD") should ensure that the land being selected for the wind power project can be legally used for this purpose and that all regulations regarding land use/land cover are within compliance. SREDA will issue a land use "No Objection Certificate (NOC)" examining the layout of the project to ensure the proper utilization of wind resources in Bangladesh as the resource is very limited. A Bangladesh attorney, specializing in land rights, land contracts and permitting/zoning should be retained by the PD to review and

approve all land required for the project site.

- **Availability of wind resource:** The project developer is required to ensure the availability of wind resource at the site based on the various parameters measured for the purpose. The project developer is also required to ensure the quality of the data captured (using industry best practices) at a particular site for a quality assessment of the wind resource potential, project viability and sustainability of the project over the designed life time of the project. All the acquired data must be vetted by SREDA which will ensure the bankability of the data.

  In order to facilitate the wind industry, the time series data from all the wind masts installed by SREDA will be made available with a minimum charge. Project Developer is encouraged to gather site specific data themselves but will be given access to SREDA's wind data base. Additionally, the Project Developer is responsible for paying for an Independent Wind Energy Report (approved by the banking industry) and will share said report with SREDA.

  Every project developer must have to share collected data with SREDA to improve the national wind map of Bangladesh developed by SREDA.

- **Technically and commercially feasible grid connectivity:** The PD should ensure that grid connectivity is technically and commercially feasible at the site selected. PD will complete the proper interconnection study application. The study will determine all thermal, system impact and facility issues associated with interconnecting a project of a certain size (MWs) onto the system. All of these technical issues will be identified and quantified within the Interconnection Feasibility Study ("IFS") report including cost estimates of the facilities needed to be installed for safe operation of the project. The PD will be responsible for the cost of all of the IFS. Following the completion of the IFS, GOB will provide an Interconnection Agreement ("IA") to PD for execution within 90 days. The IFS and the PD's selected turbine with detailed electrical characteristics will be exhibits to the IA.

- **Transport logistics:** The project developer is responsible for securing all transportation permits as well as transporting all components of the wind power project to the selected site and repairing any road damages that might resulting from transport. Developer is responsible for providing SREDA with a Logistics Plan which describes in detail all legal and permitting requirements associated of turbine component delivery to the project site, including all transport equipment being used and delivery schedule. A road repair performance bond may be required to be posted with GOB transportation department prior delivery activities.

- **Environmental acceptability:** If the project site footprint is in the proximity of forest land or in the vicinity of threatened and endangered migratory bird and bat habitats and/or their flight routes, and heritage establishments, the PD should ensure availability of necessary clearances from concerning authorities. Bat & Bird Survey is needed for environment clearance. All clearance certificate should be submitted to SREDA, who will provide a final Clearance certificate to install wind turbines in the specific sites.

- **Noise Study:** The acceptable sound limit in Bangladesh in the silent areas is 50 dB for the daytime and 40dB for night; in residential areas 55dB for day and 45dB for night; in the mixed areas 60dB for day and 50dB for night; in commercial areas 70dB for day and 60dB for night; and in the industrial areas 75dB for day and 70dB for night. A Noise study will be paid for by the PD and incorporated into the final layout such that the noise level comply the existing Noise Pollution (Control) Rules of Bangladesh. Noise issues from turbines will be evaluated relative to existing ambient noise levels.

- **Shadow Flicker Study:** A Shadow Flicker study will be paid for by the PD prior to final layout. Any substantive issues with residences, schools or hospitals will be mitigated by an adjustment of turbine(s) locations with the draft layout or natural or man-made obstructions to reduce the flicker from room in occupied buildings. For inhabitants near wind turbines, shadow flicker should be limited to 30 hours in a year and 30 minutes in a day.

- **Microwave/Communication Towers:** Developer is responsible for completing a microwave study when a near final turbine layout is complete. Any proposed turbine location that is in direct line-of-sight of any two towers will be moved such that there is no communication disturbance with the final commissioned projects.

- **Civil Aviation:** The final turbine layout will be sent to the Civil Aviation agency to approve its location proximity to nearby public/commercial airports and approve a lighting design. PD must have to take clearance from Civil Aviation Authority of Bangladesh.

IV. Type certification and quality assurance (*Details in Exhibit B*)

Type certification is to confirm that the wind turbine type is designed, documented and manufactured in conformity with industry best practices, other technical requirements to ensure reliable operation over a twenty plus year life. The PD should provide the manufacturer's report/assessment that the exact turbine model and size (including hub height) selected is designed for the wind resource regime (i. e. wind class) at the project site. A copy of the manufacturers Mechanical Loads Analysis may also be required – analysis which is conducted for the near final turbine layout. Also PD should provide a turbine diagram showing dimension of foundation, hub, nacelle and blades with detailed information on the specific model chosen should be included. Geotech study (for the project site) should be submitted to GOB with accompanying P.E. stamped engineering design demonstrating the appropriate turbine foundation design.

To facilitate investors, lenders and developers, SREDA will publicize a list of recommended turbines that are certified for Class II/III wind regimes with a reputation for high performance and high availability percentages. The list will be regularly updated by SREDA through an online automated tracking and approval process.

V. Micro-siting *(Details in Exhibit C)*

Micro-siting is the maximization of energy production through the optimized placement of wind turbine generators within the project site boundary, considering all physical constraints of the area. The optimized location of wind turbine generators (WTGs) may be computed by running an appropriate wind flow modelling, optimization tools (linear and Non-linear) and techniques in any terrain conditions. PD's shall use industry best practices and the modeling tools to microsite each turbine.

VI. Grid connectivity

For establishment of the evacuation arrangement and grid connectivity, the Bangladesh Energy Regulatory Commission Order/Regulation shall be applicable.

VII. Metering and Real Time Monitoring

It shall be necessary for the project developer to install Availability Based Tariff (ABT) compliant meter with telecommunication facility at the pooling station/sub-Station to enable implementation of forecasting and scheduling regulation. It shall also be mandatory to communicate vital grid parameters on real time basis to respective Regional Load Dispatch Centre. These requirements will be described in detail within the power purchase agreement.

VIII. Online Registry and Performance Reporting of Wind turbines

An online registry of wind turbines installed in the country will be created by SREDA. PD is required to report once a year of the project as a whole, presenting on energy performance generally, maintenance, training needs/plans, community acceptance and educational opportunities for workforce development.

IX. Energy Storage Systems

Wind being variable in nature and having low CUF in comparison to conventional power, energy storage systems will play a vital role to ensure grid stability. The project developer may prudently use energy storage technologies in line with Policy issued by the GOB for this purpose. **SREDA suggests to install energy storage devices which will cover 5% of plant capacity to ensure the grid safety.**

X. Decommissioning Plan

The proposal to establish wind power project should necessarily include decommissioning plan of the wind turbine after completion of its useful life. SREDA will formulate guidelines for decommissioning of the wind turbines in consultation with stakeholders.

XI. Community Development Plan:

The success of any wind energy project that occupies a large footprint is to be good neighbors within the community. The PD should develop an actionable plan that demonstrates how they will integrate with the community. These activities could be implemented in the following ways:

- Community listening meetings prior, during and after construction to answer questions and receive feedback
- Community payments to assist with a community goal
- Educational program to inspire community youth to work in RE
- Build a kiosk that is available near a community library or the project site that describes benefits of RE

XII. Compensation policy:

If any person or organization claims to get affected by the project or any hazardous situation occurred in the project, an independent committee will be formed by SREDA with the approval of power division to investigate the event. If the PD is found responsible for the claimed situation, PD will be responsible to provide compensation to the affected person or organization.

XIII. Implementation of guidelines:

The NOC of SREDA is an instrument of PPA signing for the project. Power division will not allow any developer to sign PPA without the NOC of SREDA for the specific project. After getting the Letter of intent (LOI), PD's have to apply for the NOC of SREDA along with charges determined by SREDA board. The NOC is mandatory for government agencies also to implement any wind power project. The NOC will ensure the sustainability of the project, grid stability and sustainable environment.

EXHIBIT A:

Site Selection and Feasibility:

Land Use Permission: In case of allotment of land or land use permission given by GOB for the purpose of development of wind power project, a maximum period of 3 years may be allowed for development (including wind data collection, all related studies, logistics arrangement) and start of commissioning of the project after allotment/ permission to use land given by the Government. If the project is not developed within the given time frame or has not met specific development goals agreed to within the NOC/Land Use Permission document, the land allotment/ land use permission will be cancelled, however, extension may be granted through an appeal process. In that case, the Project developer will need to apply for time extension in SREDA and collect NOC and formally describe and present the reasons for the project's delay. But the extension will not be more than 2 years considering the status of the project.

For existing project developers, where land is already allotted or land use permission is not given, prior to issue of these guidelines may be given another 36 months subject to providing an undertaking that they are willing to develop and start commissioning of the project within stipulated period of 36 months.

- **Land Use Permission:**
  The land rights/permissions for the required project site to match a term/period equal to greater than the length of a standard power purchase agreement and will include all of the following uses:
    - Siting and maintaining meteorological towers and/or associated equipment for measuring and monitoring the wind resource,
    - Conducting environmental and/or cultural studies as required by the government or financial institutions,
    - Laydown/Mobilization areas for construction equipment, turbine components and related electrical equipment,
    - Construction rights above and below grade for all wind energy related equipment, Operations & Maintenance building, and project electrical substation,
    - Operation and maintenance rights of the energy project,
    - Right of way from project site to the point of interconnection with the grid.

- **Availability of wind resource:**

Requirements of Independent Wind Engineering Report will be an 8760, seasonal description including wind rose and long-term forecast section.

- **Technically and commercially feasible grid connectivity:**

Interconnection Feasibility Study (IFS) should include the following information:

- Project Name and size (MWs)
- Project Boundary Map including primary point of interconnection and alternate point of interconnection (Lat/Long coordinates should be required)
- **PD's proof of 10% of land control**
- Turbine selection and all electrical characteristics needed to complete electrical study
- Proposed Commercial Operation Date
- Signed letter from the manufacturer that the PD has an executed Turbine Supply agreement and the manufacturer's production and delivery schedule match the project's Commercial Operation Date.
- Compliance of Grid Regulations— PD shall have the certification that Wind Turbine is in compliance of the grid regulations including Active/Reactive power control, Low Voltage Ride Through (LVRT), power quality and other applicable requirements as per standards and regulations prescribed by BERC.

- **Transport logistics:**

Detailed Transportation Logistics Plan will include these details but not limited to-

A. Entity responsible for delivery
B. Component delivery Schedule
C. Component delivery route
D. Report on highest allowable load on roads by season
E. Maximum Weight of each component (loaded on truck and trailer)
F. Fees and permits required and schedule to procure said fees/permits

- **Environmental & Cultural Plan:**

This comprehensive plan will be approved by SREDA and authorized GOB agencies and include at a minimum:

- An Estimated Annual Emissions reduction forecast (A form can be collected from SREDA website),
- An Avian study;
- If the project is in proximity of cultural, historical or archeological sites, a Mitigation Plan to minimize or eliminate disturbances of these sites and/or propose setbacks

SREDA will evaluate and approve all studies above or ensure that the appropriate GOB authority has reviewed and approved.

EXHIBIT B:

Type certification and quality assurance

PD's Certification Application shall include:

- the final selected turbine model and size (including hub height and other design dimensions)
    - Internationally Accredited Certification Body shall be required. The wind turbine model shall possess a valid type certificate issued by any internationally accredited certification body as per IEC /GL type certification scheme, along with certified power curve.
- a signed letter from the manufacturer stating selected turbine model is optimally designed for the wind resource regime (i.e. wind class) at the project site.
- a copy of the manufacturers Mechanical Loads Analysis may also be required – analysis which is conducted for the near final turbine layout, demonstrating the project site turbulence is within industry and company standards for the selected model.
- a turbine diagram showing dimension of foundation, hub, nacelle and blades with detailed information on the specific model chosen should be included.
- A foundation design(s) for all project turbines
    - Geotech study (for the project site) should be submitted to SREDA with accompanying Professional Engineer stamped engineering design demonstrating the appropriate turbine foundation for soil type.

EXHIBIT C:

Micro-siting guidelines:

Micro-siting criteria are-

i. PD(s) shall optimize the wind turbine locations within the project site footprint using appropriate wind flow modelling and optimization tools (linear and Non- linear)/techniques subject to site assessment as per IEC 61400-1 standard for turbine safety considering extreme wind, flow inclination, vertical wind shear, and turbulence with added wake effects and corrections for terrain complexity etc.

ii. PD shall be responsible for securing buffer land to preserve wind resource from a future competitive wind project.

iii. PD(s) shall try to maintain a wake loss (in terms of energy loss) of 10% used to derive net capacity factor from gross capacity factor of the wind farm.

iv. Turbine Setbacks should be consistent with the Land Use Permission rights and contract details and Bangladesh zoning laws:

- Developer(s) shall maintain a distance of 1.1 X Total Turbine Height (measuring from the ground to the tip of the blade in the upright position) from Public Roads, railway tracks, highways, buildings, public institutions and Existing High Voltage lines and property lines.
- Developer(s) shall not site wind turbines within 500 m of any occupied dwelling/residence for the mitigation of noise. A Residence is defined as a building occupied/lived-in full time.

The above mentioned Micro siting techniques will assist investors/developers with maximizing energy production while balancing neighboring landowner rights as well mitigating issues with existing infrastructure.

Checklist for NOC

List of documents needed to submit to SREDA by Project Developer-

1. Contract/ agreement of land lease with farm layout
2. Wind data assessment report
3. Interconnection Feasibility Study report
4. Logistics Plan with clearance from respective authorities
5. Environmental clearance from DOE
6. Noise study report
7. Shadow flicker study report
8. Microwave study report (if applicable)
9. Clearance from Civil Aviation Authority
10. Type certification documents of the turbines mentioned in exhibit B
11. Grid connectivity plan
12. Energy storage installation plan
13. Decommissioning plan
14. Community Development Plan
15. Letter of intent (LOI) copy
16. Bank charges in the form of Pay order for NOC.