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[REEEI]

An Institute of the Polytechnic of Namibia

TECHNICAL SPECIFICATION

SUPPLY - AND DELIVERY OF WIND RESOURCE ASSESSMENT EQUIPMENT (PON/REEEI)

TENDER 1/2009

1. Introduction

The Polytechnic of Namibia in co-operation with its partners has embarked on a National Wind Resource Assessment Project (NWRAP). The objective of the project is to generate information on the wind resources available in Namibia in order to provide engineers with accurate wind resource data to enable the sizing of optimum wind driven technologies for specified applications. The applications include utility-scale electricity generation, standalone electricity generation and water pumping. To this end, the project aims to cover the entire country, initially with special emphasis on areas of known good wind resources.

The information will be generated through the statistical analysis of wind data that will be acquired by means of electronic data acquisition systems, consisting of relevant sensors, data loggers and ancillary equipment. The systems will be mounted on the existing mobile phone mast infrastructure of one of the partners of NWRAP and the acquired data will be transmitted to a central processing office via the network of the said partner. It is envisaged that data will be acquired over a period of five years.

2. Electronic Data Acquisition System

Each mast will be provided with a data acquisition system consisting of the following electronic equipment mounted on the indicated heights above ground level (AGL):

- one anemometer at maximum 50 m AGL
- one wind direction vane at maximum 50 m AGL
- one anemometer at 3 m AGL
- one dry bulb temperature probe at 3 m AGL
- one pyranometer mounted at 3 m AGL
- one data logger at 3 m AGL
- one data communication module at 3 m AGL
- all required signal conditioning modules for the indicated equipment
- all electronic ancillaries required - or proposed for the indicated equipment, such as memory cards

Wind speed is recorded at two heights AGL in order to enable the calculation of wind shear, as well as to enable the comparison of the wind resource at 3 m AGL with that reported by Namibia Meteorological Services and its predecessor, the South African Weather Bureau at the same height.

All equipment shall be supplied with all original user manuals and technical specifications pertaining to the indicated equipment, as well as all software required for the remote downloading of recorded data via the internet or otherwise.

3. Local Content

In order to reduce the cost - and weight of imported items, equipment that can be locally sourced may be sourced in Namibia or Southern Africa. This includes cabling for sensors not already supplied with cabling, mounting booms and - brackets, shelter boxes for loggers, lightning protection -, as well as photovoltaic power supply systems, if not supplied as part of the loggers or data communication modules.

Tenderers are required to provide specifications for suitable sensor cabling, lightning protection -, photovoltaic systems and batteries. Cabling will be tied to the frames of masts and will therefore be exposed directly to ambient conditions, i.e. dry bulb temperature variations between - 10 °C and 45 °C, solar radiation of up to 1 200 W/m^2 and relative humidity variations between 10 % and 90 %. Special attention must be given to requirements regarding cable sheathing and drain wiring.

4. Electro-Magnetic Interference

As the project cannot afford dedicated wind masts, there is no alternative but to mount the required equipment on existing telecommunications towers. This situation may lead to electro-magnetic interference between the data acquisition - and the telecommunication systems and vice versa.

Equipment supplied via this tender are to comply with the CE marking requirements for electro-magnetic compatibility, or the requirements of any other acceptable agency or standard, such as FCC. Details of the test results of emissions and immunity shall be submitted with the tender, as well as recommendations on how the influence of electro-magnetic emissions of telecommunications equipment on the offered data acquisition equipment can be eliminated or minimized. In this regard, the specification of sensor cabling should include requirements in respect of number of cores, core diameters, core screening and cable screening.

5. Lightning Protection

In order to evaluate the compliance of existing lightning protection systems on the mobile phone masts with the requirements of lightning protection for the offered data acquisition systems, tenderers are requested to supply complete specifications for the same, including the interfacing of sensors, data loggers etc. with the existing systems.

6. Specification for Data Acquisition Systems

Sensors

The minimum specifications for sensors are to be as indicated in table 1 on page 4.

Parameter	Anemometer	Wind Vane	Temperature	Pyranometer
		≤ 4° dead band		
Measurement Range	0 m/s to 50 m/s	0° to 360°	-30 °C to 50 °C	0 W/m^2 to 1500 W/m^2
Starting Threshold	≤ 1 m/s	≤ 1 m/s	na	na
Distance Constant	≤ 3 m	na	na	na
Operating Temperature Range	-30 °C to 50 °C	-30 °C to 50 °C	-30 °C to 50 °C	-30 °C to 50 °C
Operating Humidity Range	0 % to 100 %	0 % to 100 %	0 % to 100 %	0 % to 100 %
System Error	≤ 0.2 m/s	≤ 1 %	≤ 1.2 °C	≤ 1 %
Recording Resolution	≤ 0.1 m/s	≤ 1.5 °	≤ 0.1 °C	≤ 1 W/m^2

Table 1: Minimum Sensor Specifications

All anemometers and pyranometers must be accompanied by calibration certificates from reputable organisations. The calibration for anemometers shall be valid for a minimum range of 4 m/s to 16 m/s, but preferably up to 25 m/s. As the equipment will be installed in the field for a period of five years, tenderers are required to indicate the likely drifts in the indicated parameters with time over that period, as well as proposed re-calibration intervals.

Data Loggers

Data logger shall satisfy the following general criteria:

- be electronic and compatible with the required sensor types, number of sensors and measurement parameters
- be capable of storing data values in a serial format with corresponding time and date stamps
- contribute negligible errors to the signals received from the sensors in order to render system accuracies as specified in table 1. The errors shall be quantified in terms of a calibration certificate for each logger.
- have an internal data storage capacity of at least 40 days accommodating all specified measurement parameters at an averaging interval of 10 minutes
- offer retrievable data storage media in the form of memory cards with a capacity of at least 6 months accommodating all specified measurement parameters at an averaging interval of 10 minutes
- operate on battery power
- operate in the environmental extremes specified in table 1
- have an internal real time clock with automatic lap year correction and an accuracy of approximately 1 minute per month
- data channels to have individually programmable slopes and offsets
- selectable sampling rates that includes 1 Hz
- selectable recording intervals that includes 10 minutes and 1 hour, with calculation and storage of common statistical parameters
- accommodate a data communication module

Data Communication Module

The data communication module shall be compliant with the following mobile telecommunication system requirements:

- GSM (minimum) or GSM & UMTS
- 900 MHz (minimum) or 900 MHz & 1 800 MHz or 900 MHz &1 800 MHz & 2 100 MHz or 900 MHz & 2 100 MHz
- GPRS (minimum) of E-GPRS

7. Quantity Discount

The project aims to equip as many as possible masts with the indicated data acquisition systems. Initial estimates for the number of systems range between five and ten, depending on the value of offers received, the funds available for the project and variations in exchange rate between the Namibian Dollar and the currencies of offers. Tenders are requested to indicate the value of quantity discounts in their tenders.

8. Data Management Software

In view of the large number of sites where data will be recorded, the project is considering the acquisition of data management software that enables the management of installed equipment, queries, data, location, personnel and documentation. Tenderers are requested to submit prices and specifications for the same.

9. Warranty

All equipment supplied shall carry a warranty of not less than two years against materials and workmanship. Tenderers shall indicate this fact in their tender documents.

10. Delivery

Prices of equipment shall include all taxes and charges including insurance for the delivery of the equipment by airmail courier to the Polytechnic of Namibia, 13 Storch St, Windhoek, Namibia, and attention: Mr. Kudakwashe Ndhlukula, REEEI. Telephone number +264-61-2072154.

11. Further Information

a. Further information regarding this tender may be obtained from Mr. Bernard Siepker of the Department of Mechanical Engineering of the Polytechnic of Namibia. Telephone number +264-61-2072058, fax number +264-61-2072142 or e-mail at bsiepker@polytechnic.edu.na.

12. **Deadline for Submission of Tenders**

The Tender will close on 24 July 2009 at 16:00.

END.