

## Noticias FAD/FEV

### Convocatoria de concurso para elaborar el estudio de viabilidad del «Establecimiento de un parque eólico en Tay Tay, Provincia de Palawan» (República de Filipinas)

La entidad **PNOC ENERGY DEVELOPMENT CORPORATION de Filipinas** convoca a las empresas españolas a un concurso para elaborar el Estudio de Viabilidad sobre «Establecimiento de un parque eólico en Tay Tay, provincia de Palawan».

Este Estudio de Viabilidad, aprobado en la Comisión del FEV de 9 de marzo de 2005, tiene un coste aproximado de **hasta 150.000 Euros** y será financiado con cargo a la Línea de Financiación de Estudios de Viabilidad (FEV Modalidad Pública), cuyos recursos provienen del Fondo de Ayuda al Desarrollo.

Las empresas españolas interesadas en la realización del estudio deberán presentar sus ofertas, en las direcciones que se detallan más abajo, según la documentación contenida en los Términos de Referencia **no más tarde de las 12:00 horas del día 4 de noviembre de 2005 y en cada uno de los destinos señalados en esta convocatoria.**

PNOC ENERGY DEVELOPMENT CORPORATION de Filipinas, bajo la supervisión de la Administración española, evaluará las ofertas presentadas de acuerdo con los baremos recogidos en los Términos de Referencia.

Se presentarán, dentro del plazo previsto y en las direcciones que se indican, los siguientes ejemplares en inglés:

- Dos ejemplares, que se entregarán a PNO ENERGY DEVELOPMENT CORPORATION de Filipinas
- Un ejemplar, que se entregará a la Administración española (Subdirección General de Fomento Financiero de la Internacionalización) en Madrid.

#### 1) PNO ENERGY DEVELOPMENT CORPORATION

Persona(s) responsable(s): Mr. Francisco M. Dolor - Chairman  
Dirección: Energy Center, Bonifacio Global City, 1634 Taguig, Metro Manila  
Teléfono: (00 - 63-2) 893 60 01 / 1320  
Fax: (00 - 63-2) 815 27 47  
Correo electrónico: lim@energy.com.ph

#### 2) SUBDIRECCIÓN GENERAL DE FOMENTO FINANCIERO DE LA INTERNACIONALIZACIÓN

Persona(s) responsable(s): Ana M. Oviedo Muñoz  
Dirección: Paseo de la Castellana, 162 Planta: 9 -28046 MADRID



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Teléfono: +34 91 583 52 89.

Fax: +34 91-349-35-12

Correo electrónico: sgfomento.ssc@mcx.es

Para cualquier información pueden dirigirse a la SUBDIRECCIÓN GENERAL DE FOMENTO FINANCIERO DE LA INTERNACIONALIZACIÓN y a:

#### **OFICINA ECONÓMICA Y COMERCIAL DE LA EMBAJADA DE ESPAÑA EN FILIPINAS**

**Consejero Económico y Comercial:** D. José Miguel Cortés Arcas

**Dirección:** 27th. Floor, Yuchengco Tower. RCBC Plaza Sen. Gil J. Puyat Cor. Ayala Ave.; Makaty City, Metro Manila

**Teléfono:** (00 - 63 - 2) 843 37 74 / 75

**Fax:** (00 - 63 - 2) 843 37 90

**Correo electrónico:** manila@mcx.es

## **Terms of reference**

### **Background and rationale for site selection**



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PNOC Energy Development Corporation (PNOC EDC) is a wholly-owned subsidiary of the state-owned Philippine National Oil Company which undertakes the exploration and development of the country's indigenous energy resources to address the country's rapidly increasing power needs and to lessen dependency on imported oil.

In 1997, PNOC-EDC marked its formal entry into the power generation business with the commercial operation of two of its BOT power projects: the 47 MW Mindanao I geothermal power project in North Cotabato in March 1997 and Leyte-Cebu power facilities (comprising of the 125 MW Upper Mahiao and 77 MW Malitbog I power plants) in November 1997. The Leyte-Luzon power facilities (comprising of the 154 MW Malitbog II & III, 180 MW Mahanagdong and 49 MW Leyte Optimization power plants) commercially operated in June 1998, followed by the 48 MW Mindanao II geothermal power project in North Cotabato in June 1999. As part of its continuing efforts to also use geothermal energy for non-power purposes, drying facilities in Palinpinon (0.4 MW) and Manito were installed.

PNOC EDC was directed by the Energy Secretary in 1999 to look into possible development of commercial wind farms in Philippines as part of the Department of Energy's (DOE) program on the development of renewable energy sources i.e. ocean, solar and wind. In view of this directive, PNOC EDC studied available reports, researches, wind data & maps to be able to identify prospective areas for commercial wind power development. Specifically, PNOC EDC studied the Wind Energy Resource Atlas of the Philippines prepared by the National Renewable Energy Laboratory (NREL) of the US in 1999 and the feasibility study conducted by the Japan External Trade Organization (JETRO) in 1998.

Based on the wind mapping study of NREL, the Philippines could support over 70,000 MW of potential installed capacity. The highest mean wind speed occurring in the Northern Luzon area.

NREL reviewed numerous sources of wind speed data and previous wind energy assessments as part of its overall evaluation. Several global wind datasets, which have recently become available, including land surface observations, marine data, and upper-air data, were used in this study. Specifically, the surface datasets used by NREL in their assessment included the following:

1. Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) average wind speed and wind direction, by month, for 44 stations from 1961 to 1992. PAGASA also provided NREL with the Climatological Normal of Surface Winds in the Philippines and the Solar Radiation and Wind Mapping of the Philippines reports.
2. National Power Corporation (NPC) wind resource monitoring programs that were operated from 1994 to 1997.
3. Global climatic database obtained from the US National Climatic Data Center (NCDC)
4. Marine Climatic Atlas of the World
5. Special Sensor Microwave Imager (SSM/I)

As part of the International Atmospheric and Environmental Research Development Program of 1998, the Ministry of International Trade and Industry (MITI) of Japan commissioned JETRO to undertake a feasibility study on the wind power development in the Philippines particularly in the Northern Luzon area. The results of their study indicated a total of 120 MW wind development potential in Northern Luzon.

PNOC EDC also conducted complementary studies to validate the wind resource estimates in Northern Luzon by engaging the services of the Manila Observatory, a local Consultant in March 2000. They conducted an independent study to determine how much wind energy is available in the area using PAGASA and NPC wind data.

PNOC EDC also hired the services of Garrad Hassan and Partners Limited (GHP), an international consulting firm, to provide preliminary design and assessment of a wind farm site with an estimated capacity of about 40 MW in Bo. Saoit, Burgos, Ilocos Norte which is currently for development and in the bidding stage. It is financed with an ODA loan from Japan through the Japan Bank for International Cooperation (JBIC). It is expected to be commissioned by 2006.

In view of these developments, PNOC EDC intends to pursue the development of other wind farms across the archipelago to further augment the country's energy needs using indigenous sources and reduce CO<sub>2</sub> emissions. This can be done through long-term wind data gathering in potential areas in Luzon, Visayas and Mindanao and requires both technology transfer and special equipment for reliable measurement and interpretation of data.

PNOC EDC, with the assistance of NEDA, aims to utilize the existing financial cooperation program between Spain and the Philippines for the period 2001-2003 by tapping into the US\$5 M donation component for the execution of feasibility studies made by Spanish enterprises.

The proposed site for long-term wind study in this proposal is the Municipality of Taytay in the island province of Palawan.

The Philippine Wind Atlas categorizes Northern Palawan as a potential site for wind farms. The Palawan Island is a long strip of land, technically still part of Luzon, orientated in a NE-SW direction. The overseeing body for all forms of development in the province is the Palawan Council for Sustainable Development (PCSD). PCSD's main office is in the provincial capital, Puerto Princesa.



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The recommended site is the eastern coast, which makes it open to the north -easterly monsoon. The coast is mostly mud and does not have any corals. Nearby, a village is located where the fishermen reside. A few mangroves exist in the area, but according to the representatives of the PCSD, the area is not protected. During low tide, the water recedes to about 50 meters away from the coastline.

Wind speeds measured at the site exceeded 6 m/s. There are also some signs of flagging on the mangroves and interviews with the local yielded positive results.

The transmission line of the island's cooperative extends to about 20 kilometres away from the site. Future studies on the area must include the technical feasibility of connecting to this grid.

## 1. Objective of the study

PNOC EDC seeks the services of a qualified technical Spanish consulting firm (to be referred hereinafter as the Consultant) to perform a number of technical undertakings for a timely and successful implementation of the Project. The assignment called for this document will be done in stages with each stage defined by its own methodology, scope of work and project schedule. Likewise minimum qualification requirements for the Consultant's personnel are outlined in detail for strict compliance.



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STAGE	TYPE OF WORK
1	<b>Training of PNOC EDC Staff 1<sup>st</sup> Stage.</b> 1.1. Training in Site Identification and selection. 1.2. Training in Selection, Installation, Operation and Maintenance of Atmospheric Data Gathering Equipment /Instruments
2	Site Survey and Selection in Taytay, Palawan
3	Provision of Equipment and Instruments for Data Gathering 3.1. Preparation of Technical Specifications 3.2. Provision of Equipment/Instruments. 3.3. Inspection of Equipment/Instruments.
4	Installation of Equipment and Instruments 4.1. Delivery of Equipment/Instruments to Site. 4.2. Installation of Equipment/Instruments. 4.3. Commissioning of Equipment/Instruments.
5	Data Gathering and Processing. 5.1. Initial Downloading of Data. 5.2. Training of PNOC EDC Staff 2 <sup>nd</sup> Stage: 5.2.1. Data Processing, Interpretation and Management. 5.2.2. Wind resource Analysis. 5.2.3. Micro-siting and Estimation of Annual Energy Production.
6	Feasibility Study

## 2. General conditions

### 2.1. Location

The area of concern is the municipality of Taytay in the northern part of the Island of Palawan, Western Visaya Region.

### 2.2. Description of the Study

The study shall include site identification, wind resource assessment and feasibility study of the wind farm site mentioned above for the future development by PNOC EDC. This shall include all the stages specified in Sections 1 and 3 of these Terms of Reference (TOR).

The training program included as part of the scope shall allow the transfer of technology to PNOC EDC for future replication of the wind resource assessment activities.

### 2.3. Eligible Firms

This tender is restricted to Spanish firms.

## 3. Study methodology and scope of work

The Consultant shall do the following works according to the methodology hereinafter discussed. An implementation schedule of the works shall initially be prepared by the Consultant and shall be approved by PNOC EDC. The implementation schedule shall include the manpower requirements in each activity, their possible mobilization outside the Consultant's headquarters or workplace and other details for PNOC EDC to know how the Consultant will undertake the works. The Consultant shall be provided with office space within PNOC EDC head office in Fort Bonifacio for the duration of the deployment to the Philippines.



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### 3.1. Training of PNOC EDC Staff

#### 3.1.1. General

The Consultant shall train two (2) technical personnel from the Power Department chosen by PNOC EDC for each training module (1<sup>st</sup> and 2<sup>nd</sup> Stages). Such training shall be done in the Consultant's head office or other appropriate venue (manufacturer's plant, wind farms, software maker's office) to ensure that all data and materials necessary for the successful execution of the training are immediately available.

PNOC EDC proposes a minimum of seven (7) days, excluding travel time, for each training stage.

The cost for training materials, logistics, trainers, venue and other related expenses during the training period shall be borne by the Consultant.

The Consultant shall also bear the following cost:

- a. Unrestricted return coach/economy air fare.
- b. Hotel accommodation in, at least, 3 star hotel in the country of training.

- c. Land transportation within the country of training.
- d. Daily allowance of € 100 person/day during the effective time of training.

The training shall be conducted in English. One month after the completion of each training module, a post-training report shall be prepared by the Consultant and presented to PNOC EDC.

### 3.1.2. 1<sup>st</sup> Stage

#### 3.1.2.1. Training in Site Identification and Selection

The Consultant shall prepare and implement a training program for two (2) PNOC EDC personnel in the potential wind farm Site Identification and Selection. The training shall focus on criteria for selection and the corresponding evaluation procedures. It must particularly focus on complex terrain in tropical locations typical of the Philippines setting. Likewise, criteria for siting the meteorology mast/s shall be given emphasis in this module.

#### 3.1.2.2. Training in Selection, Installation, Operation and Maintenance of Atmospheric Data Gathering Equipment/Instruments

The Consultant shall orient the PNOC EDC staff in the available equipment and instruments for atmospheric data gathering. They shall also be trained in the selection, installation, operation and maintenance of such equipment/instruments to ensure accurate data gathering in the potential site. Calibration of the instruments shall be discussed and demonstrated by the Consultant.

It is preferred by PNOC EDC that representatives from the manufacturer are of the equipment and instruments are used by the Consultant in majority of the discussions in this training module. A visit to the manufacturer's production facility shall be given a premium in the evaluation of the proposals.

### 3.1.3. 2<sup>nd</sup> Stage

#### 3.1.3.1. Training in Atmospheric Data Processing Interpretation, Management and Application in Wind Resource Assessments

The Consultant shall train the technical personnel of PNOC EDC in atmospheric data processing, interpretation, management and application in wind energy assessments. Particular focus shall be given in the management of the data gathered from the meteorological masts using either specialized software or commercial office productivity software.

The Consultant shall provide the necessary hardware and software required for this training module.

#### 3.1.3.2. Training in Wind Atlas Analysis and Simulations Programs with emphasis on complex terrain

The Consultant shall conduct a training in wind atlas analysis and simulation programs like Wind Farmer, Wind Pro, etc., or some other similar software designed for



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developing wind atlases, modelling wind farms and estimating annual energy production of wind farms developed by Spanish Firms.

The Consultant can either conduct the training using personnel from its own organization or employ the services of certified trainers from the software maker's organization, as long as the software manufacturer's standard training modules are followed. Similarly, the venue for such training may be either the Consultant head office or the software marker's office.

### **3.2. Site Survey and Selection in Taytay, Palawan**

The Consultant shall conduct site surveys in Taytay, Palawan with the PNOC EDC staff trained in the 1<sup>st</sup> Stage of training. The objective is to put into practice what has been learned by PNOC EDC staff and identify mast site, and initially assess all factors related to the future development of the wind farm.

Site survey reports and recommended sites for long-term wind resource monitoring (met. mast location/s) shall be prepared and documented by the Consultant and presented to PNOC EDC.

### **3.3. Equipment and Instruments to be used by the Consultant for Data Gathering**

All equipment and instruments to be used by the Consultant for long-term wind data gathering shall be brand new.

For purposes of the feasibility study and future application for bank financing, one year of continuous wind data is required. In the event that the feasibility study yields negative, the Consultant may retrieve the mast and instruments from the site. Costs for re-exporting the equipment and instruments shall be borne by the Consultant.

If the feasibility study yields positive and PNOC decides to apply for an ODA loan to pursue its development, the mast and all ancillaries shall be turned over to PNOC EDC to continue with the data gathering until the wind farm is operational. This additional data would be used to refine the operational parameters of the wind farm such as extreme wind speeds, seasonal variations, wind shear, etc.



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#### **3.3.1. Preparation of Technical Specifications**

The Consultant shall prepare the technical specifications for the equipment and instruments to be used in gathering long term data at the potential site. The specifications shall include all the necessary details of the hardware he will require based on the recommended minimum specifications of PNOC EDC as described in Annex I.

#### **3.3.2. Equipment/Instruments to be used by the Consultant**

PNOC EDC has previously used meteorological mast with "Symphonie" data logger manufacturer by NRG Systems. In any case, PNOC EDC shall accept the equipment manufactured in Spain and recommended by the Consultant as long as the said equipment is compatible with the wind atlas software.

Taxes and duties to be due for the imported equipment shall be reimbursed by PNOC EDC to the Consultant. The Consultant is therefore expected to closely coordinate with PNOC EDC regarding the procurement and shipping of the said items.

### 3.3.3. *Inspection of Equipment/ Instruments*

The Consultant, with the assistance of PNOC EDC, shall be responsible for the release of the equipment from customs. He shall inspect and ensure that all the equipment and instruments are complete and complying with the specifications prepared in Section 3.3.1. Should there be any deviation from the specifications, the Consultant shall address such deviations and take the necessary steps to correct them. An inspection report shall be submitted to PNOC EDC no later than ten (10) days after the completion of the inspection.

The equipment and instruments provided by the Consultant may be delivered to and temporarily stored in PNOC EDC warehouse facility in Manila until these are transported to the site where it shall be installed. The whole cost of transportation of this equipment and instruments shall be borne by the Consultant.

### 3.4. *Delivery, Installation and Commissioning of Equipment and Instruments*

The Consultant shall have the equipment and instruments delivered to the chosen site for installation bearing all the transport cost related to it. PNOC EDC may assist the Consultant by providing information on available local transporters.

Once delivered to the site, the Consultant shall install the equipment and instruments with the assistance of PNOC EDC personnel. The installation itself shall be used as a field practice of what has been learned in the training program described in Section 3.1.

After installation, the Consultant shall commission the meteorological mast, calibrating as necessary and testing if all functions are working properly.

PNOC EDC personnel shall assist the Consultant at this stage.

Procedures shall be detailed and documented for PNOC EDC's future reference in an installation report that shall be submitted one (1) month from the commissioning date.

### 3.5. *Data Gathering and Processing*

- The Consultant shall assist PNOC EDC in the downloading of data one month after the commissioning of the individual meteorological masts. All the cost of PNOC EDC staff during the initial downloading shall be to PNOC EDC's account.
- The Consultant shall set up a data management system and instruct PNOC EDC staff in its use.
- The Consultant shall provide a licensed copy of the wind resource analysis software introduced during the training of PNOC EDC personnel. These shall be installed in the data analysis hardware to be provided also by the Consultant. The Consultant shall initially guide PNOC EDC staff in the analysis of the wind resource for each site using the data gathered.
- After the collection of 12 months of continuous atmospheric data, the Consultant shall perform micro-siting analysis and Annual Energy Production (AEP) estimation for the potential wind farm sites for another 2 months. The results of the



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- micro-siting studies shall form part of the final report to be prepared by the Consultant and serve as a basis for the feasibility study.
- The Consultant shall gather other relevant data (commercial, financial and technical, etc.) after the AEP for the particular sites has been established and prepare a Complete Feasibility Study, i.e., technical (wind resource assessment, basic wind farm design, transmission line, substation, costing, equipment transportation strategy), commercial and financial. PNOC EDC shall provide the Consultant with all relevant data in as far as practicable.
  - System Impact Studies (SIS) and integration with existing electrical network defining/specifying all the transmission lines and substations required for the wind farm, topographic surveys and geotechnical investigations shall be carried out by the Consultant.

#### 4. Guidelines for the submission of the tender

The companies interested in the tender must present their offers according to the conditions established by these Terms of Reference. Three copies will be presented, as follows: two copies in English for the PNOC Energy Development Corporation and one copy in Spanish for the State Secretariat for Tourism and Trade. The copies will be forwarded to the following addresses:

PNOC ENERGY DEVELOPMENT CORPORATION  
 Bids and Awards Committee  
 Person in charge: Francisco M. Dolor - Chairman  
 Address: Energy Center, Bonifacio Global City, 1634 Taguig, Metro Manila, Philippines  
 Telephone: 632 893-6001/1320  
 Fax: 632 815 2747  
 E mail: lim@energy.com.ph

SECRETARIA DE ESTADO DE TURISMO Y COMERCIO  
 Dirección General de Comercio e Inversiones  
 Person in charge: Ana M. Oviedo Muñoz  
 Address: Paseo de la Castellana 162, planta 9- 28046 Madrid  
 Telephone: 91- 583 52 89  
 Fax: 91 349 35 12  
 E mail: aoviedo@mcx.es



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The offer must include the eligibility requirements and the technical and economic proposals.

The eligibility requirement, which should be submitted together with the technical proposal, consists of the following documents:

- Financial records from the last year available (balance sheet and audited accounts)
- General information on the company:
  - Share ownership
  - Date of incorporation
  - Turnover data for the last 5 years

- Number of employees. Full time and part time employees. Employees with a high education diploma

The technical proposal must emphasize the company experience in the field of Wind Power projects. Experience in the field of Transmission and Substation projects shall be also assessed positively. The company must prove its experience in similar projects in this field. The projects carried out in the beneficiary country (Philippines) and the European Union will be also taken into account. Consequently, the technical proposal should include the following:

- Information about the most important projects carried out, indicating clearly: client name, contract value, start and finishing dates for the projects, working team and description of the project.
- Studies similar in technical content and objectives with the one intended to be contracted through this technical assistance should be particularly emphasized. References from the beneficiaries will also be presented.
- Description of the proposed objectives and works
- Strategy and the method of realization of the works
- Activity schedule (working schedule) and a break down of the hours each expert will work on the project by task.
- Information on the structure and experience of the proposed working team and the resúmenes (3 pages maximum) of the proposed staff will be presented, including at least the following data:
  - name
  - place and date of birth
  - nationality
  - proposed position within the project
  - titles and courses
  - languages (English is a requirement)
  - experience in similar projects (indicating the responsibilities within)
  - other (academic experience, publications etc)



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The economic proposal must include the cost of all items needed for the realization of the project and it will be presented in detail, clearly indicating the units, the cost of each unit and the total cost for each item. The cost of each expert of the working team, the experts' schedule and the expenses for the study elaboration (travels, per diem and other expenses) will be presented in detail also.

General requirements for key experts:

- studies in the field
- very good level of English
- relevant experience (list of projects)

Specific requirements and qualifications for the Consultant's team:

- Wind Resource Assessment Expert.
  - Master's degree in Engineering or Applied Science.
  - Five years (5) experience in wind resource assessment.
  - Knowledgeable with the use of modern wind resource assessment tools.

- Electrical Engineer.
  - Professional Electrical Engineer (University degree).
  - Five (5) years experience in wind farm integration to electric grid networks.
  - Knowledgeable in design and/or construction of HV Transmission Lines.
- Civil Engineer.
  - Professional Civil Engineer
  - Five (5) years experience in wind farm site selection, including assessment of topography.
  - Experience in design of foundations for meteorological mast.

Any change in the structure of the working team proposed by the company must be submitted to the PNOC Energy Development Corporation and the Spanish Administration for approval and if not accepted, it can be a reason for exclusion from the bid or for contract cancellation.

The firm awarded the contract will present a list of potential Spanish suppliers of goods and services required for the execution of the project.

The offers must have a period of validity of 6 months during which the participant companies are committed to honour the conditions of the offer, especially those concerning the structure of the working team, scope of the project, activities proposed for the objectives' realization, methodology, period of execution and price.

In case of association between consulting companies or subcontracting, the competencies and responsibilities of each one of the associates or subcontracting parties must be clearly defined.

During the elaboration of the study, the company awarded the contract will submit periodically a progress report stating the tasks carried out during the relevant period, existing and foreseen problems, proposed actions and possible deviations from the initial schedule. Both an electronic and a paper version of the Final Report will be presented to the State Secretariat for Tourism and Trade.

The maximum percentage allowed for local expenses will be equivalent to 15% of the total contract amount.

Payment method:

- 25% after signing the contract, with the "no objection" from the Spanish Administration
- 25% after reaching and intermediate milestone to be agreed upon by the PNOC Energy Development Corporation and the contract - winning company. The Client shall sign the corresponding certificate and send it to the Spanish Administration to receive the «no objection».
- 50% once the study has been concluded and approved by the PNOC Energy Development Corporation and the Spanish Administration

The works must begin as soon as the contract - winning company considers appropriate and no later than two weeks after signing the contract.



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## 5. Working terms

The lump sum fee for the commission will be EUR 150,000. This commission will be funded by a grant from the Spanish Feasibility Studies Financing Facility (FEV).

## 6. Selection / award criteria

The selection and award criteria will be as follows:

CRITERIA	WEIGHT
<b>1. Technical capacity</b> 1.1. Wind Power Projects in the last five years 1.2. Transmission/Substation Projects in the last five years 1.3. International Experience	<b>15 points</b> 8 points 4 points 3 points
<b>2. Approach and Methodology</b> 2.1 Approach 2.2 Scope of the Study 2.3 Methodology 2.4 Time Schedule	<b>40 points</b> 10 points 10 points 15 points 5 points
<b>3 Proposed Staff</b> 3.1 Wind Resource Expert 3.2 Civil Engineer 3.3 Electrical Engineer	<b>25 points</b> 15 points 5 points 5 points
<b>4. Economic Offer</b>	<b>20 points</b>
<b>TOTAL</b>	<b>100 points</b>



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## Annex I

### Recommended Hardware and Software Specifications

#### 1. Hardware

##### a. Meteorological Masts (2 complete units)

###### *Minimum Requirements*

Tower Height:	Minimum of 30 meters
Anemometers:	Calibrated, Cup type, at least two (2) units per mast (different heights)
Wind vane:	at least one (1) unit per mast
Temperature sensor:	one (1) unit per mast
Logger	
Storage media:	Multimedia Card (MMC), Secure Disk (SD), CompactFlash; at least 2 pieces per mast
Storage size:	At least 128 MB per media
Installation kit/tools:	Specified and Provided
Display/ Manuals	
Language:	English

##### b. Ancillaries

###### i. Data Processing Equipment (1 unit)

Processor	Intel Pentium-M 1.7 GHz or higher
Motherboard	Intel Chipset
Memory	1 G DDR RAM
Hard Drive	60.0 GB minimum
Floppy Drive	Integrated or External USB 1.44 MB 3.5" FDD
Other Drives	Integrated or External USB MMC/SD Card Drives
Video Memory	128.0 MB minimum
DVD Drive	Super Multi Drive DVD±RW / DVD-RAM drive - IDE
Monitor	13.3" XGA TFT 1024 x 768 resolution
Fax/Modem	56k V.90 Data Fax/Modem
Ethernet Port/Card	Integrated 10/100 Mbps
Supports IEEE 802.11B wireless LAN	
Ports	1 Parallel, 1 Video, 3 USB
Mouse	Integrated Accupoint or Touchpad + USB with Scroll Wheel
Battery	Li-Ion 4.5 hrs
Power Supply	240 VAC
Weight	4.2 lbs.

###### ii. Mobile Printer (1 unit)

###### *Minimum Specifications*

Print Resolution:	1200 X 1200 dpi (black), 4800 X 1200 dpi (color)
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Print Speed:	Up to 5 ppm (black); 2 ppm (color)
Duty Cycles:	Up to 500 pages per month, letter
Interface:	Parallel, USB, Fast Infrared, CompactFlash Type I card slot
Printer Memory:	16 MB
Battery:	Rechargeable Li-Ion
Power Supply:	240 VAC

iii. Digital Camera

*Minimum Specifications*

Type:	Single-lens reflex digital camera (SLR)
Effective Pixels:	6.1 million
Image Sensor:	23.7 x 15.6 mm RGB CCD; 6.24 million total pixels
Image Size:	L (3,008 x 2,000) / M (2,240 x 1,488) / S (1,504 x 1,000)
Sensitivity:	ISO equivalency 200 to 1600
LCD Monitor:	2.0-in., 1300,000-dot, low-temperature polysilicon TFT LCD with brightness adjustment
Interface:	USB: Mass storage and PTP selectable
Storage Media:	CompactFlash™(CF) Card (Type I / II) and Microdrive™ minimum of 512MB
Zoom Lens:	70-300mm f/4-5.6G (4.3 zoom ratio)

iv. Hand-held Global Positioning System (GPS) with Electronic Compass and Barometric Altimeter

*Minimum Specifications*

*GPS Performance*

Receiver:	WAAS-enabled, 12-parallel-channel GPS receiver continuously tracks and uses up to 12 satellites to compute and update your position
Acquisition times:	Warm - Approximately 15 seconds Cold - Approximately 45 seconds
GPS accuracy:	Position: < 15 meters, 95% typical* Velocity: 0.05 meter/sec steady state

*Electronic Compass Feature*

Accuracy:	±2 degrees with proper calibration (typical); ±5 degrees extreme northern and southern latitudes
Resolution:	1 degree

*Barometric Altimeter Feature*

Accuracy:	10 feet with proper calibration (user and/or automatic calibration)
Resolution:	1 foot
Range:	– 2,000 to 30,000 feet
Elevation computer:	Current elevation, resettable minimum and maximum elevation, ascent/descent rate, total ascent/descent, average and maximum ascent/descent rate
Pressure:	Local pressure (mbar/inches HG), 12-hour automatic pressure trend recording



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## 2. Software

- a. Operating System
  - Operating system shall be Windows XP Professional, Service Pack 2
- b. Productivity Software
  - Latest version of Microsoft Office, Professional Edition
- c. Wind Resource Assessment Software
  - Latest version of Wind Farmer, Wind Pro or other wind resource and micro-siting software to be proposed by the Consultant



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