

The TOR is a request for proposals for work to identify and prepare wind power projects, and develop a wind power development strategy

**TERMS OF REFERENCE:
PREPARATION OF PILOT WIND POWER SUBPROJECTS**

Background

< Brief description of objectives, scope and status of implementation of Bank project. Plans for windfarm power development under the Project, information on current status of wind development and resource data availability >

Purpose of the Study

1. The study will assess the feasibility of wind power development in the country, recommend a development strategy, and prepare a wind power project component for inclusion in the World Bank Project. The study will consider both grid-interactive wind farms, and off-grid application of smaller wind turbines.

2. The study will be conducted in two phases:

Phase I: Preparation of a Wind Power Development Strategy

Phase II: Preparation of the Wind Power Project Component of the Project

The work to be performed in the second phase will be contingent on the findings and recommendations of the Phase I study. The following scope of work focuses on the Phase I effort.

Phase I Scope of Work

Task 1 - Technical Evaluation of Wind Power Utilization

3. The Consultant will obtain baseline information necessary for developing the wind energy development strategy. Geographic focus of the data collection will be in the coastal regions of the country where previous studies have indicated a good wind potential. The information may include the following:

- ! Wind resource data;
 - ! Energy generation mix, demand/growth forecasts, load profiles, capacity expansion plans, and rural electrification plans;
 - ! Off-grid electricity demand and supply;
 - ! Marginal cost of grid and off-grid power supply;
 - ! Grid characteristics;
 - ! Local industrial capability and capacity to support wind power development, including organizations and infrastructure capability for installation, operation and maintenance of wind power projects;
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- ! Institutional, policy and infrastructural support available for private power development; and
- ! Socio-cultural and environmental information to ensure that there are no obvious problems with a site prior to considering it seriously.

4. The Consultant, along with the counterpart agencies shall select and visit a few representative sites to assess regional and local factors that may influence wind power project development. The consultant shall complete the following investigations to the degree necessary to allow specification of a sample set of projects in Task 2:

a. Site Suitability - Evaluate potential sites for wind power development by considering criteria such as: (i) wind resource characteristics, (ii) suitability of terrain for turbine siting, foundations, and general construction operations, (iii) site preliminary geotechnical suitability (soil characteristics, coastal environment, etc.), (iv) land availability, (v) site access and capability to accommodate specialized requirements for wind power projects, (e.g., custom hauling and hoisting equipment, modification of existing roads, bridges, culverts for transport of heavy equipment); (vi) access to the grid or loads; (vii) sufficiency of demand, both grid- and off-grid; (viii) local economic development potential; and (ix) the site institutional, environmental and socio-cultural acceptability. The latter preliminary assessment of infrastructural, environmental, sociological and cultural issues associated with wind power project development will evaluate whether there are serious impediments which may thwart development at the site. This assessment shall include determination of the need for resettlement of local population.

b. Wind Resource Assessment and Wind Power Plant Specification and Performance - Develop representative layouts for wind farms and grid interconnections and estimate energy production. Develop representative layouts for stand-alone wind or wind/hybrid power systems to satisfy local demand for applications such as village electrification, irrigation, etc. The Consultant shall use geographical extrapolation (if necessary) of wind resource data to quantify the potential for replication of the wind power projects and to estimate the annual wind power output at demand sites.

The Consultant shall assess the confidence with which wind farm energy production can be calculated with the available wind resource data at the selected sites. The degree to which the interannual variability of the resource and micrositing impacts is understood and its affect on wind farm energy production shall be determined.

c. Impact of Wind Power on the Grid Network and Generation Mix - the Consultant shall evaluate the suitability of the existing grid for wind farm development. The analysis should recommend: (a) requirements for new lines or substations, (b) requirements for strengthening of existing lines (need for reactive compensation, etc.), and/or (c) need for new operational strategies when wind farm capacity is added, i.e., what capacity will wind power displace and/or shift in the generation mix. The Government will provide the necessary generation expansion planning analyses using their WASP capacity expansion planning model. The consultants would advise on the parameters to be used as input to the WASP model.

5. Task 1 will result in a selection of a number of sample projects. The number and type of grid and/or off-grid projects are to be jointly decided with the Government (for example, two grid-interactive wind farms and two off-grid wind power projects). These sample projects will be selected on the basis of their replicability, scale, technical configuration, project costs, energy and power output, characteristics of conventional energy and power displaced, loads served, maintenance costs, etc.

Task 2 - Specification and Evaluation of Representative Sample Projects

6. Task 2 will consist of the following:

a. Sample Projects Specification. The Consultant will prepare conceptual designs for the sample wind power projects.

b. Economic and Financial Assessment. The Consultant shall perform an economic and financial evaluation of the sample wind power projects specified in Task 2 (a). The analyses shall include estimates of: (i) Economic and financial internal rates of return (EIRR and FIRR), and net present value of the projects; (ii) average incremental economic and financial cost of electricity generated; and (iii) assessment of the financial risks of the project. Cost assumptions with regard to turbines and associated equipment, engineering and administration, installation and interconnection, operation and maintenance, cost of alternative energy displaced, foreign exchange and interest rates, and other financial and economic assumptions shall be clearly identified.

7. The Consultant shall complete a sensitivity analysis to identify and quantify changes in financial and technical parameters necessary to ensure project viability. The consultant will also recommend fiscal and other incentives and strategies necessary to enhance the financial and economic attractiveness of the projects.

c. Environmental and Social Screening. The Consultant will conduct an environmental and Social screening to identify potential obstacles that may require a more detailed impact assessment. The environmental and social safeguards screening shall follow World Bank Guidelines, and consider aspects such as aesthetic impacts, safety issues of turbine failure and public access, impacts of construction activity, impacts on wildlife and wildlife habitat, electromagnetic interference, land-use impact, noise impact, effects on birds, community impact during construction, and resettlement. The pre-screening shall also address disruption to use of, or access to local natural resources, pressures on ecologically sensitive areas, and protection of local communities and their resource base.

d. General Recommendation. The Consultant shall make a concise written recommendation (with supporting documentation), as to the advisability and scope for wind energy development in the country. If wind energy development is found to be feasible, the consultant shall fulfill Tasks 3 and 4 below, after obtaining authorization to proceed from the World Bank. If the decision is not to proceed further, the Consultant will prepare a Report presenting the findings, analyses, and recommendations.

Task 3 - Preparation of Wind Power Development Strategy

8. The Consultant shall prepare a wind power development strategic plan. The strategy would include the following:

- ! Role of wind energy for grid and off-grid use within the framework of a least cost electricity supply plan and estimate of potential energy contribution to the country;
 - ! Wind Development Strategy (including promotion of private sector participation, pricing and other policy changes, pilot wind farms, and stand-alone and wind-hybrid off-grid pilot projects, institutional strengthening, etc.);
 - ! Specification of pilot projects, if any;
 - ! Roles and responsibilities of key public and private sector organizations;
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- ! Additional resource assessment requirements;
- ! Grid improvement requirements;
- ! Training; and
- ! Institutional development.

Task 4 - Preparation of the Phase II Workplan

9. The Consultant will propose a wind power component for inclusion in the Project and prepare the Phase II workplan for Preparation of the Wind Power Project Component. The wind power component could include funds for private sector wind energy development, pilot projects (if needed), and technical assistance. The workplan will describe the elements of the proposed wind power component and its estimated cost, and specify the preparatory work to be completed by the time of Bank appraisal. These include: draft scopes of work and estimated cost, reporting requirements, staffing and skill requirements, additional studies and tests to be performed by the local counterparts, and the Phase II schedule.

10. Some geotechnical studies, soil tests, environmental assessments, or other investigations may be needed prior to starting Phase II work. If so, before departure from the country, the Consultant will identify the sites to be investigated, specify the tests and studies to be done by the local counterparts, and assist them in drafting the Terms of Reference for the work to be performed.

Staffing

11. The Consultant shall be experienced in (1) wind resource evaluation and site selection, wind turbine selection, wind farm siting, and interconnection with utility grid systems, (2) wind or wind/hybrid off-grid power systems, (3) economic, financial and investment analyses of wind power projects, and (4) institutional and environmental concerns with wind power development. It is estimated that a two to three-person team may be necessary to conduct this work.

Reporting Requirements

12. The Consultant is required to prepare and submit a comprehensive report which will include an Executive Summary, and the Main Report. As appropriate, the report should contain annexes with details such as contacts, project design and implementation data for the sample projects, written expressions of interest from potential project sponsors and implementers (if obtained), Terms of Reference, grid maps and interconnection diagrams, performance analyses, details of economic and financial analyses, and other relevant information.

13. Four bound and one unbound copy of the Draft Report shall be sent to the World Bank. After incorporation of comments on the Draft Report, four bound and one unbound copy of a Final Report consistent with World Bank format and guidelines shall be prepared and submitted.

14. The Consultant shall undertake a data collection, fact finding, and preliminary analysis mission to the country in support of this effort. The Consultant will debrief the Government, and the World Bank Resident Mission in the country on preliminary findings prior to departure.

Schedule

15. The level of effort is estimated at about 5 working days/person to prepare for the visit to the country; 15 workdays/person in the country for field data collection, and preliminary analysis; and 10

workdays/person in the home office for final analysis and report writing. The team members will return to will complete their project analysis and reporting tasks at their home office.

16. The Draft Report is due at the World Bank approximately six weeks after the Consultant's arrival in the country. As necessary, the Consultant will be allowed up to 2 additional work days/person to incorporate World Bank and Government comments into a final report. The Final Report is due at the World Bank within two weeks of receipt of comments.

Proposal Preparation Guidelines

17. Interested consultants are requested to submit a concise but comprehensive proposal of which describes:

TECHNICAL PROPOSAL

- ! Understanding of the requirements.
- ! Technical approach, including minimum criteria for proceeding beyond Task 2.
- ! Allocation of staff time (staff-days) across tasks classified by specialty and seniority.
- ! Implementation schedule
- ! Corporate experience in conducting similar activities. Give short descriptions of prior studies, including names, addresses and telephone/fax numbers of references.
- ! Short descriptions of the qualifications and experience of key staff assigned to this study. The proposed project manager must be identified and be available for the during of the study. Detailed Curriculum Vitae of the key personnel should be provided in an annex.
- ! Facilities, including software available for conducting the study.

COST PROPOSAL

- ! Cost proposal should detail the direct labor charges in terms of staff-days and costs; travel costs showing number of trips, routing, number of days in the field, cost of tickets, and per diem costs; other costs including telephone, copying, courier, and other miscellaneous expenses; overhead costs; general and administrative costs, contingencies, and fees. Total estimated cost and the cost/task must be provided. Costs must be given in U.S. dollars.

18. The technical proposal should be no more than fifteen (15) pages of single spaced text and graphics, exclusive of curriculum vitae. The technical proposal and the cost proposal must be submitted under separate cover in sealed envelopes. No reference to costs must be made in the technical proposal. Three (3) copies of each of the technical and cost proposals should be submitted. The envelope containing the technical and cost proposals should be marked accordingly and indicate the name and address of the bidder as well as the name of the proposal.

19. The proposal must be signed by an officer of the firm authorized to negotiate and sign contracts on behalf of the firm. The proposal must be held valid for 60 days and during which the consultant will undertake to maintain, without change, the proposed staffing (including the named personnel), and will hold both the rates and total price proposed. The anticipated date of contract award is April 20, 1994.

20. The award of person-month contract is anticipated. Payment will be based on agreed upon rates and allowances, and on reimbursable items.

21. The proposers are expected to bear the full costs of preparation and submission of the proposals.

Proposal Selection Procedure

22. The technical proposals will be evaluated first, independently and free from the influence of the price. The technical proposal will be evaluated in three principal categories shown below:

1. Understanding of the requirements of the study, the technical approach, and the schedule.
2. The qualifications and competence of the assigned key personnel in the relevant fields of expertise.
3. The Consultant's general experience in the field of assignment.

Predominant weight will be given to Criterion #2 and Criterion #1, in order of priority. Of lesser importance is Criterion #3. For technical proposals deemed responsive to the Request for Proposals, the cost proposals will be evaluated next. While the overriding consideration is the technical quality of the proposal, the Bank will consider the reasonableness of the proposed cost in selecting the Consultant. The World Bank will enter into negotiations with the selected Consultant. During negotiations, discussions of the work plan, staffing, inputs required from the Government, and proposed contract would be completed. A Sample Form of Contract for Consultancy Services is shown in Attachment 3.

23. The World Bank reserves the right not to award any contract.
