PROJECT DEVELOPMENT FACILITY

REQUEST FOR PIPELINE ENTRY AND PDF BLOC B APPROVAL

AGENCY'S PROJECT ID: PIMS # 3292
COUNTRY: MOROCCO
PROJECT TITLE: MOROCCO: SAHARA WIND PHASE I / TARFAYA (400-500 MW) ON-GRID WIND ELECTRICITY IN A LIBERALIZED MARKET
GEF AGENCY: UNITED NATIONS DEVELOPMENT PROGRAMME (UNDP)/WORLD-BANK
OTHER EXECUTING AGENCY(IES): AFRICAN DEVELOPMENT BANK (AFDB)
DURATION: 18 MONTHS
GEF FOCAL AREA: CLIMATE CHANGE
GEF OPERATIONAL PROGRAMME: OP-6: "PROMOTING the Adoption Of Renewable Energy By Removing Barriers And Reducing Implementation Costs. OP #7: "Reducing the long-term Costs of Low Greenhouse Gas Emitting Energy Technologies".
ESTIMATED WORKPROGRAM ENTRY DATE: JUNE 2006

GEF STRATEGIC PRIORITY: (SP3) POWER SECTOR POLICY FRAMEWORKS SUPPORTIVE OF RENEWABLE ENERGY AND ENERGY EFFICIENCY; (SP2) INCREASED ACCESS TO LOCAL SOURCES OF FINANCING FOR RENEWABLE ENERGY AND EFFICIENCY

ESTIMATED STARTING DATE: SEPTEMBER 2005

CONTRIBUTION TO KEY INDICATORS OF THE BUSINESS PLAN:

- Estimated total GHG emissions reductions in the amount of 16.4 million tons of CO2 over 20 years
- Financial leverage of 1 to 16 approximately

Financing Plan (in US$)	
GEF Allocation	
Project (estimated)	25,500,000
PDF-A	
PDF-B	350,000
PDF-C	
Sub-Total	**25,850,000**
Co-Financing	
TVIG and Partners/ USTDA (PDF-B in cash)	525,000
Bilateral Co-sponsor	403,000
ESMAP/World Bank[1]	450,000
UNDP-Field Offices (PDF-B in cash)	150,000
ONE (PDF-B in-kind)	42,000
CDER and Partners (PDF-B in-kind)	160,000
Private SPV	390,000,000
Sub-Total Co-financing	**391,703,000**
Total Project Cost	**417,580,000**

RECORD OF ENDORSEMENT ON BEHALF OF THE GOVERNMENT

All National GEF Operational Focal Points have endorsed the project proposal

Approved on behalf of the UNDP-GEF/WB-GEF and the AfDB. This proposal has been prepared in accordance with GEF policies and procedures and meets the standards of the GEF Project Review Criteria for approval.

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[1] World Bank management fees accounted for separately.

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LIST OF ACRONYMS AND ABREVIATIONS

AFD: French Development Agency
AfDB: African Development Bank
AMENDIS: Power Distribution Company in Tangers and Tetouan
AMISOLE: Association Marocaine des Industries Solaires et Eoliennes
CDER: National Renewable Energy Center
CED: Compagnie Eolienne du Détroit
EIA: Environmental Impact Assessment
EIB: European Investment Bank
ESCO: Energy Service Company
FDI: Foreign Direct Investment
GEF: Global Environment Facility
HV: High Voltage
IEPF: Environmental Institute for Francophone Countries
IPP: Independent Power Producer
JLEC: Jorf Lasfar Energy Company (JLEC)
LV: Low voltage
LYDEC: Power Distribution Company in Casablanca
MEM: Ministry of Energy and Mines
METRAGAZ: Société d'Exploitation du Gazoduc Maghreb-Europe
MV: Medium Voltage
ONAREP: National Oil Exploitation Bureau
ONE: Office National de l'Electricité
PBSS: Production-Based Smart Subsidy
PPIAF: Public-Private Infrastructure Advisory Facility
REDAL: Power Distribution Company in Rabat
SAMIR: Société Marocaine des Industries de Raffinage
SME: Small and Medium Enterprise
SPV: Special Purpose Vehicle
TSO: Transmission System Operator
UNDP: United Nations Development Programme
USTDA: United States Trade and Development Agency

CURRENCY EQUIVALENTS

Currency Unit = Moroccan Dirham (MAD)
1 $US = 9.47 MAD (6 months average rate May-October 2003; Source BANK AL MAGHRIB)

UNITS OF MEASURE

1 A = Ampere
1 GWh = Gigawatt-hour = 1000 MWh
1 KV = Kilovolt = 1000 volts (V)
1 KVA = Kilowatt-ampere = 1000 VA
1 KW = Kilowatt = 1000 watts (W)
1 KWh = Kilowatt-hour = 1000 Wh
1 MVA = Mega-volt ampere = 1000 KVA
1 MW = Megawatt = 1000 KW
1 MWh = Megawatt hour = 1000 kWh
1 TOE = Tonne Oil Equivalent

PART I – PROJECT CONCEPT

A. SUMMARY

A.1. Unlike its neighboring Algeria or Tunisia, Morocco is poorly endowed with local conventional primary energy resources and imports roughly 97% of its energy supplies. Electric power consumption, which has been rising at approximately 6% per year, is predominantly serviced by thermal power plants. As a result, the cost of generating electric power in Morocco is highly dependent upon fluctuations of the price of imported oil and coal. At the same time, the country has a vast and documented – yet largely untapped – wind energy potential in the order of some 6,000 MW according to the estimates of the National Renewable Energy Center (CDER -- Centre National des Energies Renouvelables). The proposed involvement of the Global Environment Facility in the design and future implementation of a 400 MW[2] on-grid wind electricity project along the Tarfaya coastline (North of the former Spanish territory of Western Sahara) has 4 specific and complementary objectives:

(i) to *showcase how the removal of significant regulatory, market, legal/legislative and institutional barriers that are underway will enable a private-sector led large-scale adoption of wind-energy technology* in a middle income economic environment such as Morocco;

(ii) to *displace sizable fossil fuel consumption in* Morocco, break the grip of the dependence on middle-East and North African oil imports[3], and supply the Iberian electricity market with renewable electricity at competitive costs;

(iii) *to leverage private sector financial, technological and human resources* by engaging both the local and international private sector actors within the established conducive renewable energy sector policy and business environment. In setting out to build a multi-phase/multi-year 5 GW on-grid wind energy plant in the Tarfaya area, the project will attract significant economies of scale to impact the global wind energy market structure (i.e. corporate or private wind industry associations, financial service providers) in ways that demonstrate the commercial viability and local socio-economic advantages of wind energy technology transfer in addition to the associated environmental pay-offs; and,

(iv) to evaluate the impact of the project on Morocco's electricity grid and its long term energy security of supply in order to *demonstrate the advantages, that a regional integrated approach in a liberalized market framework can provide*, compared to what can be achieved on a domestic basis for developing renewable energies.

A.2. The rationale behind the development of renewable energies on a regional basis may actually be key to breaking the current costs issue linked to resource limitations experienced in most developed countries despite their willingness to sustain proactive policies towards the development of renewables. It is highly unlikely that without GEF's involvement, the above developments would take

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2 The exact electric capacity will be determined by technical grid impact studies.

3 Morocco has an estimated 97% energy dependency's on the region's oil resources with almost no endogenous oil resources. Displacing the sizable fossil fuel imports while helping the country develop its large endogenous renewable energy potential in a comprehensive way, could instead afford the country the opportunity to supply the booming Iberian electricity market, with large quantities of clean, renewable electricity produced and delivered at competitive costs given the expected economies of scale.

place in a reasonable timeframe and in a self-sustaining fashion with the intended global environmental and poverty reduction impacts.

A.3. Project preparation activities will focus on executing, supervising and reporting on all feasibility studies (technical Feasibility studies, financial/economic feasibility studies, sector policy review, electricity/renewable tariff setting and governance issues review, legal and regulatory feasibility studies, social and institutional feasibility studies), design of the project's monitoring and evaluation framework, preparation and execution of all required environmental impact assessments, conducting of national workshops/sensitization campaigns, procurement training to all relevant stakeholders, regional workshops/steering committee meetings, as well as producing a Project Brief that lays out a clear rationale for GEF co-financing.

B. COUNTRY OWNERSHIP

B.1. COUNTRY ELIGIBILITY

B.1.1. Morocco accessed to the UNFCCC on January 15, 2002. As a non-Annex I country, Morocco is eligible for financing from the GEF through the mechanisms established by the Convention. The Project has received the endorsement from the GEF Operational Focal Point (copy of endorsement letter) and is formulated in accordance with national priorities.

B.2. COUNTRY DRIVENNESS

Figure 1: Proposed Location of Wind Farm in Tarfaya, Morocco (dot on coast)

B.2.1. This Project is being submitted upon request from the Government of Morocco (copy of endorsement letter from the national GEF Operational Focal Point *is on file).* This Project reflects a national priority, namely the increase of the share of "clean energy" to supply the national grid through cost-efficient appropriate technology that reduces greenhouse gas emissions. The Moroccan authorities have shown evidence of their intention to develop the country's energy sector on a sustainable basis through the use of renewables. The Minister of Energy's BONN 2004 Declaration has set the context within which this project proposal was prepared. In February 02nd 2005, the Ministry of Energy announced the creation of a National Directorate of Electricity and Green Power to harness the various efforts towards the materialization of the BONN 2004 commitments. CDER has particularly stressed the need to establish a National Renewable Electricity Code that would offer a targeted incentive framework for the private sector and provide the required regulatory safeguards. ONE's involvement and contribution to the project's

proposal is consistent with its policy of developing renewable energies. The participation of ONE and other key local players from both the public and private sectors is essential to ensure the success of the project and enable a transfer of know-how to local industries and organizations.

B.2.2. The project would allow for the involvement of local partners as far upstream as possible. It will necessarily take into account all current knowledge and experiences related to wind power in the country to date and apply some of the lessons that are emerging from the nascent Tunisia experience. Partners would be involved in as many aspects of the project as possible as to guarantee an optimal capacity building with transfer of know-how, the viability of local firms and other industrial related capabilities in the field of wind energy. A complete stakeholder analysis will be carried out as part of the PDF B. Given that this project will target different stakeholder groups, separate consultations will be undertaken for stakeholders. During the implementation of the PDF B two phases of stakeholder workshops have been planned: one at the beginning to obtain stakeholder input for the design of the project and one towards the end to validate the final project proposal. Further, the project intends to anchor the wind energy sector firmly in the country by developing and involving local industry and private sector, which will be part of the sustainability strategy that will be followed in developing the resource.

C. PROGRAM AND POLICY CONFORMITY

C.1. PROGRAM DESIGNATION AND CONFORMITY

C.1.1. The proposed activities fall under the purview of GEF Operational programs # 6: "Promoting the adoption of renewable energy by removing barriers and reducing implementation costs", and #7: "Reducing the long-term Costs of Low Greenhouse Gas Emitting Energy Technologies". Sahara Wind Phase 1 [4] fits in the following GEF strategic priorities: (SP2) Increased Access to Local Sources of Financing for Renewable Energy and Efficiency and (SP3) Power Sector Policy Frameworks Supportive of Renewable Energy and Energy Efficiency.

C.2. PROJECT DESIGN

Brief Overview of the Energy/Electricity Sector in Morocco

C.2.1. The power sector in Morocco has undergone several waves of changes since the first IPPS in 1994. The Ministry of Energy and Mines (MEM) is responsible for the preparation and implementation of sector policy with regards, in particular, to planning, regulation, control and energy trade. The Ministry of Public Works is responsible for the design and implementation of hydroelectric power development projects. The Ministry of Agriculture, directly concerned with wood fuel and traditional energies (wood fuel, charcoal, animal dung, crop residues and the like), coordinates all activities related to the development, utilization and protection of the country's forest resources.

C.2.2. The organization of the sector is characterized by the division of responsibilities among public enterprises and private companies. The application and implementation of the country's energy policy falls under the purview of public enterprises such as the National Oil Exploration Bureau (ONAREP), the National Electricity Office (ONE), the Center for the Development of Renewable

[4] Sahara Wind Phase 1 refers to the initial development phase of 400-500 MW proposed under this project. Subsequent phases may be investigated (based upon the successful completion of Phase 1) to take full advantage of the region's wind potential which is estimated at 5,000 MW.

Energies (CDER) and the Water and Electric Power Distribution Boards, as well as of private companies such as the Société Marocaine des Industries de Raffinage (SAMIR), the Société d'Exploitation du Gazoduc Maghreb-Europe (METRAGAZ), the oil product distribution companies, the electric power generating companies, namely the Jorf Lasfar Energy Company (JLEC) and the Companie Eolienne du Détroit (CED), as well as the concessionary water and electric power distribution companies (LYDEC in Casablanca, REDAL in Rabat and AMENDIS in Tangers and Tetouan).

C.2.3. ONE was established by Dahir (Royal Decree) nº 1-63-226 of 5th August 1963 as a public utility with corporate status and financial autonomy. It is placed under the technical supervision of the Ministry of Energy and Mining (MEM). ONE is administered by a six member Board of Directors chaired by the Prime Minister and is managed by a Managing Director appointed by Dahir on the proposal of the overseeing Ministry. The Decree-Law of September 23rd, 1994 amends the Decree establishing ONE and stipulates that the Board is authorized to sign agreements with private corporations for the generation by the latter of electric power for installed capacity above 10 MW. Furthermore, Dahir nº 1-02-01 of January 2002 authorizes ONE to establish subsidiaries or take equity participations in companies, both in Morocco and abroad, that carry out any activity falling within its area of competence.

National Electricity Supply/Demand Overview and Sector Constraints

Generation and Consumption Trends

C.2.4. Morocco has almost forty (40) electric power plants with total installed capacity of 4,508 MW in 2003, 3138 MW of which were operated by ONE and 1,370 MW by private operators. 71% of the capacity is generated by thermal plants, 28% by hydropower plants and 1% from wind sources.

C.2.5. Generation and consumption trends are as follows. In 2003, demand for energy was met by national generation which rose by 78% from 8,617 GWh in 1990 to 15,340 GWh with an annual average growth rate of .5%, and by electric power imports. In recent years, national generation has been marked by a fall in hydropower generation (17% in 1997 against 8.6% in 2003) owing to a shortage of water resources as a result of recurring droughts and the increased utilization of thermal generating plant (67.7% in 1997 and 81.81.7% in 2003). Morocco's electric load profile for the year 2003 (Annex I page 44, ONE 2003 production figures) indicates that coal-fired power generation constituted 70.0% of the country's total electric consumption. While ONE's coal-fired capacity supplied 14% of that year's load, the Jorf Lasfar coal-fired power station, has accounted for 56% of Morocco's national electric power consumption. Other thermal generation capacities such as Heavy fuel-fired thermal plants amounted to 11.6% and renewables, mostly hydro, amounted to 9.8% of the country's consumption. In the year 2001, coal-fired thermal power plants alone amounted to 83.7 % of the country's consumption. ONE's share in national production has fallen since Morocco's interconnection with Spain was brought on stream in 1998. In 2003, the power plants operated by ONE only contributed 34.5% to national electric power generation. In 2003, 91.5% of demand was met by national generation and 8.5% by imports of electric power, which is increasingly preferred as a viable economic solution, as illustrated in Table 1 below, Moroccan power imports rose from 1998 to 2000, but fell from 2001 to 2003 because of a drought and harsh winter in Spain, which reduced the volume of power generated by the Spanish market.

Table 1: Electric Power Exchanges between Morocco and Spain (in MWh)

Year	Imports (Red Electrica Espana)	Bilateral Contracts	Spot Market	Total Imports	Exports
1998	483,397	221,100	0	704,497	0
1999	781,857	1,030,915	0	1,812,772	0
2000	590,376	1,318,115	364,979	2,273,470	0
2001	583,491	318,879	696,302	1,598,672	10,159
2002				1,389,309	33,852
2003				1,465,985	11,21

Demand Forecasts

C.2.6. Medium-term demand forecasts are based on a series of assumptions that take into account economic and demographic growth forecasts and interaction scenarios between economic growth and energy demand. The base scenario illustrated in table 2 assumes a 4% GDP growth rate between 2000 and 2010 along with a 3.5% assumption from 2011 to 2015 together with a population of some 35 million inhabitants (with an urbanization rate of 66%) by 2015[5]. The capacity forecasts were determined using end-user load curves (minerals, industry, MV professionals, LV professionals, Low Voltage residential customers -- mainly lighting and cooling/heating appliances and public lighting). Using the above approach together with an average increase in demand of 6% per annum between 2000 and 2015 yields the estimates presented in Table 2 below:

Table 2: Moroccan Energy and Electric Power Demand Forecasts

Year	Net Energy (GWh)	Peak Power (MW)	Load Factor (%)
2003	16,780	2,808	68.2%
2005	18,830	3,188	67.4%
2010	25,270	4,315	66.9%
2015	33,525	5,780	66.2%

C.2.7. Looking at the attached schedule of generation facility development/retirement extracted from ONE's mid to long-term business plan reveals that ONE expects to have a total installed capacity of some **6,290 MW by 2010**. Estimation of peak demand around 4,315 MW in table 2 above suggests that with an additional 647 MW -- representing a sensible 15% reserve margin required by most energy experts -- ONE should have a safe supply base with 4,962 MW notwithstanding operational/network security and stability issues. Taking into account the unavoidable operational security constraints (including securité n-1) further indicates that ONE's capacity expansion plans appear quite adequate and the Utility/TSO can be expected to have the required built-in reserves for optimal network management. The installed capacity as of June 2004 is 4,508 MW (3,188 MW Thermal, 1266 MW Hydro, 54 MW Wind). In 2012 it will be 6,990 MW, hence this represents an increase of 2,482 MW of which 863 MW (Nat Gas + storage pumping) will be operational already by April 2005. With the exception of 38 MW Hydro, all other capacity increase will be made using Thermal LNG & coal-fired plants. The significant reinforcements underway that will be operational in the year 2006 on the existing interconnections with Spain that will double from 700 MW to 1400 MW and Algeria that will increase from 400 MW to reach over 1700 MW, will enable ONE to dispose of a total interconnected

[5] Forecasts are from the Demographic Studies and Research Center of Morocco (CERED).

capacity of 3100 MW. Such interconnected capacity should improve ONE's operational/network security and stability issues significantly, and provide an ideal ground for large wind power developments. Since Wind energy added by ONE throughout this entire period through 2012 will amount to only 200 MW (60 MW Essaouira + 140 MW Tangiers), thus the net capacity needs should leave plenty of room open to further private sector led on-grid wind electricity developments. Annex VII indicates that 16.4 million tons of CO2 will be abated as a result of the implementation of this project based on a quick run of RETSCREEN simulated with the current load profile of Morocco.

Figure 2: Illustration of ONE's existing transmission lines, roads and Wind test/demo site in the area

C.2.8. Viewed from a different – though complementary – perspective, the above preliminary data indicates that with an estimated 6 to 10% wind electricity grid absorption capacity (to be ascertained by the grid-absorption capacity study by ONE and the CDER under PDF-B funding), up to 600+ MW of wind electricity could be locally absorbed. This means that Sahara Wind Phase 1 could easily seek to output **400-500 MW** of wind electricity to the local open spot market segment alone without any additional power transport constraints once ONE's own wind generation are accounted for. Complementary detailed technical studies and the grid absorption capacity investigation will help establish the optimal threshold for Sahara Wind Phase 1.

Development Goals

C.2.10. The development goals being pursued the Government of Morocco, ONE and UNDP-Rabat through the proposed by Sahara Wind Phase 1 project are:

- To tap the country's endogenous wind resources through the development of a large-scale wind farm to supply "green" electricity to the ONE grid and help ***alleviate the country's balance of payments*** through reduction in petroleum product imports;

- To use Sahara Wind Phase 1/ Tarfaya (400-500 MW) IPP to ***jump-start the announced liberalization of the electricity market*** and help strengthen the country's overall electricity regulatory framework. The signing of the association agreements with the EU provides the broad Euro-Mediterranean framework for Morocco's integration into the world economy, underpins the design and prospects for implementation of the subsequent phases of the Sahara Wind Project after GEF has helped set in motion the process by "kick-starting" the market. Presumably, given the capacity of the ONE's interconnected grid to absorb all of the projected output of Sahara Wind Phase 1 (400-500 MW) IPP (pending further confirmation by the findings of the grid study), exploration of the EU energy "green markets" as such has been considered out of the immediate scope of this proposal though sustainability concerns have been kept in focus;

- Attract ***sizable foreign direct investment*** and build up the country's human and institutional capacity.

- By committing itself to the deployment of up to 400-500 MW of on-grid wind capacity within the forthcoming years, the Kingdom of Morocco seeks to ***cut the country's emissions of greenhouse gases while taking a strategic position*** towards the increasing promise of the wind electricity industry in the Maghreb region and beyond;

- Seize the industrial opportunities associated with the manufacturing of various equipment parts of the envisaged wind-farm to ensure full ***integration of local industries*** and generate jobs and ***boost the local labor market***;

- Producing electricity while contributing to ***regional development, economic growth, social welfare and environmental protection*** of Morocco;

- ***Diversifying the electricity generation mix*** to ensure greater energy security and alleviate the country's reliance on imported electricity, coal and petroleum products.

Baseline Scenario

C.2. 10. In order to achieve the above development objectives, the Government of Morocco and ONE have established the liberalization of its electricity sector as a national priority and have specifically:

- Drafted or sponsored ***preliminary electricity sector legislation*** backed-by an on-going ONE-sponsored restructuring study by a credible international Management Consulting firm;
- Proceeded with the ***liberalization of the urban electricity distribution market segment*** against the background of a successful ***opening of power production*** to private operators through various IPPs;

- Taken concrete steps to significantly ***reduce ONE's wind electricity sector knowledge gap*** and ***upgrade the company's wind electricity operational capacity*** through various initiatives; and,
- Launched -- with various degrees of success -- ***wind farm IPPs***.

C.2.11. A specific earlier effort by ONE to try to jumpstart large on-grid wind power projects was the unveiling in 1997 of a plan to develop a wind farm concession scheme, similar to the one that existed in Tarifa Spain, to be located in the northern part of Morocco, across the Gibraltar straits where the wind regimes are very high (Koudia Al Baida site). Consequently, a 50 MW wind farm located at this site has been developed by a concessionaire, and ONE committed that it would: a) grant 20 years of operation to the developer; and, b) offer a long-term PPA and at the end of this period, the facilities would be transferred to ONE. This process was designed to introduce competition into project development in order to help ONE move electricity sector liberalization efforts forward. The Koudia Wind Park entered production in the year 2000 and has been supplying on average about 1.3 % of Morocco's electricity demand.

C.2.12. Building upon the above experience, ONE launched a series of consultations for the deployment of two large wind farms in the 150-200 MW range under concession schemes. Unfortunately, the results of the bidding process for those concessions proved to be higher than expected (in terms of wind electricity KWh price) and since the renewable energy tariffs scheme conceded by ONE on the Koudia Al Baida wind power concession were already high, it was argued that – if allowed to proceed – the project would undermine the efforts currently led by ONE to gradually liberalize the Moroccan electricity market, starting in 2005. Since no mechanisms have been developed by ONE for recovering these losses, the company – which already lacks competitiveness on the sales price of its electricity, in part as a result of the intense financial pressure it has been enduring in order to support a very ambitious rural electrification program – finally dropped the proposed private wind park concession tendering. After several years of an enriching wind project preparation experience, the bids were officially dropped in February 2003.

C.2.13. An important element of ONE's strategy has been to strengthen its ownership of wind energy technology through a concrete wind project preparation/implementation cycle. A smaller **3.5 MW** demo wind park called "parc éolien modèle" has been built in the same area as the larger 50 MW Koudia wind concession. This demo wind park, which is made of 7 Enercon E-40 500 kW wind turbines (financed by the German KfW[6]), has been in operation since the year 2000 and has enabled ONE to get familiar with the day-to-day operations and management of wind parks.

C.2.14. Within the above context, the national utility company, decided to move forward and develop two major wind projects; a 140 MW farm in the northern part of the country (Tangiers), and a 60 MW farm in the Center (Essaouira). The wind farms will bring ONE's total wind electricity capacity to 253 MW. Since ONE dispense concessional sources of financing of its own, it has decided to carry out the development of these wind parks alone, avoiding the production under concession scheme that was chosen for the initial 50 MW Koudia wind farm. While the studies are almost complete, the scheduled tendering for building the Essaouira 60MW wind park was issued in November 2004 with construction following thereafter, in order for the park to enter service at the end of 2006.

C.2.15. Thus, recent on-grid wind electricity developments in Morocco have been a trial and error process at best. There has been limited or no involvement of GEF, and it is fair to say that there is

[6] http://www.one.org.ma/html/m2_01_04.htm

little likelihood of major on-grid wind electricity development without GEF assistance. Nevertheless, the above learning-by-doing approach can be credited with having established a setting within which all local actors are now eager to explore – with targeted donor assistance – how past experiences can be consolidated and new and innovative schemes explored with a view to really jumpstarting a commercially self-sustaining wind-electricity sector in pure private sector terms. However, unless key local stakeholders are brought together in a well-coordinated framework of action, with a measure of GEF catalytic support, there is a strong chance that private sector led wind electricity development could actually work against the ongoing sector liberalization, rather than advancing it. Experience has often shown that government efforts at energy sector reform do not succeed without adequate donor and private sector interest and without taking into account operational challenges and realities. By removing institutional, regulatory and market barriers and developing a large-scale wind farm using an integrated and comprehensive approach, this project can act as a catalyst to help align private sector activity with ongoing government reforms.

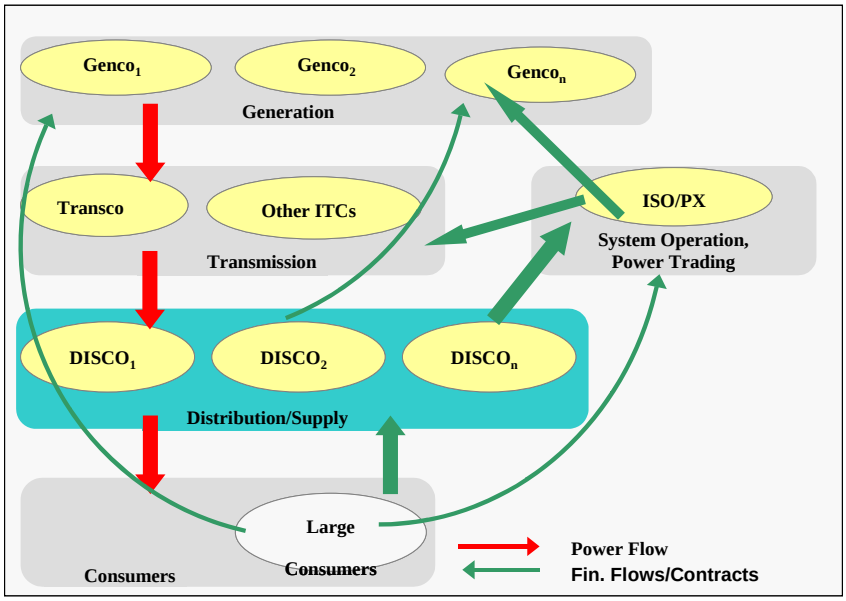
Envisaged Market Liberalization

C.2.16. Since 1988, the Moroccan National Electricity Office (ONE, the publicly owned Electric Utility which also acts as Transmission System Operator/TSO) has been interconnected to the Algerian Grid. In 1998, ONE extended its interconnection to the Spanish grid and has been importing electric power regularly at least cost in an effort to enhance both the security and reliability of electric power supply in Morocco. Both of the above interconnections have reportedly saved the country an estimated US$30 million per year on fuel expenses alone. As these interconnections have been operating at full load, ONE (the Moroccan grid operator), requested and obtained – with support from the government -- financing from AfDB, the European Investment Bank and the French Development Agency to significantly increase its interconnection capacity within the broader context of an emerging North African Regional Electric Power Pool from Algeria to Egypt with a strengthened interconnection to Spain.

C.2.17. In addition to the country's efforts to upgrade its power interconnection network, the Moroccan authorities understood that progress would be limited without a commensurate effort at re-aligning the power sector's institutions through deep institutional reforms that could sustain the gradual sector liberalization and guarantee sufficient, reliable and least-cost power supply that is vital to the country's economy. The above strategic objectives were clearly spelled out in the 2000-2004 Economic and Social Development Plan. Since early 2000, ONE has been taking concrete steps to stage its own restructuring program along with the proposed gradual sector liberalization which actually started in 1994 with the opening of production activities to Independent Power Producers (IPPs).

C.2.18. Under the plan prepared by ONE for the emergence of an open electricity market and for which the company is being re-structured, "eligible" VHV, HV, and MV customers would have access to the proposed open/spot market alongside various private producers and traders. The targeted "eligible" customers will essentially comprise the biggest customers for whom electric power prices constitute a major element of their competitiveness and consequently a major criterion for both investment and job creation decisions. It is also envisaged that alongside the above open/spot market, which will result in an electric power stock exchange governed by the rules of competition, a regulated market will operate to service households and other low voltage customers. The latter will continue to be supplied by ONE and the Distribution companies at a fixed regulated rate.

Figure 2: Illustration of Morocco's power market with ONE's role as the Transmission System Operator.



C.2.19. The implication of the above baseline scenario is a continued reliance on coal-fired or petroleum- based generation of electricity (at best) to feed ONE's network, together with a strong likelihood of continued GHG emissions in the atmosphere.

GEF Alternative

C.2.20. The proposed alternative project will remove the existing barriers to the large-scale deployment and cost reduction of on-grid wind electricity while contributing to the establishment of a conducive policy and regulatory environment for further wind electricity production in Morocco by financing/co-financing the following specific activities:

(i) **Strengthening the institutional, regulatory and operational capacities** of the various structures involved in wind energy sector development through technical assistance, namely, the Ministry of Energy, the CDER (National Renewable Energy Agency), ONE (the incumbent Power Utility in charge of all network/power transmission operations), **the power stock exchange body to be created within the context of the operation of a spot market**, along with other relevant local manufactures and private actors as needed together with sensitization of the civil society. Improvement in the electricity regulatory framework seeks to elicit further development of on-grid renewable energy deployments with a focus on feeding the liberalized market during the subsequent phases of implementation of the Sahara Wind project;

(ii) Contributing to the establishment of a **Production-Based "Smart Subsidy" (PBSS)** scheme to support the implementation/deployment and commercial operation of the intended 400-500 MW wind power capacity in a liberalized market without any PPA, as a probe into the structuring of a renewable electricity market, through regulatory innovations and market elicitation with targeted subsidies in the Maghreb region;

(iii) Designing and implementing **a partial risk guarantee scheme** to support the initial phase of Sahara Wind to offset perceived market risk while at the same time ensuring proper calibration of the PBSS subsidy;

(iv) Implementing a **TA component intended to ensure optimal integration** of the relevant local industry (including electric equipment manufacturing, electronics, mechanical, etc.);

(v) Implementing a specific **social and environmental revival component TA to ensure proper development and execution of accompanying social and environmental activities to revive the desert Tarfaya costal area**;

(vi) Implementing an **M & E component intended to ensure systematic performance monitoring** of all aspects of the Sahara Wind Project (monitoring and evaluation process, management and execution team structure, roles and responsibilities, issue escalation and decision making approach, performance metrics) to be applied to increase the operational capacity of the selected SPV.

C.2.21. The above GEF scenario assumes the deployment of turnkey 400-500 MW on-grid wind farm (acquired through structured financing/project finance, IPP concession through international competitive bidding without PPA) in lieu of a local and/or imported power based on fossil fuel generation. The cost of the above large-scale wind-farm project including the specific activities co-financed by GEF to ensure sustainability (i.e. points (i) through (vi) in paragraph C.2.20. above) together with the estimated acquisition and deployment cost of the turn-key wind-farm has to be compared to the cost of the fossil-fuel generation scenario to determine the project's incremental cost.

Financing and Wind Risk Mitigation Mechanisms

C.2.22 Because of its large size, the proposed Sahara Wind project is going to require an appropriately innovative financing mechanism and approach, one that is adapted to: (i) the high up-front capital requirements; (ii) seasonal factors; and (iii) the long payback period of a 400 MW wind farm project. While project financing is the more conventional financing tool used for large capital-intensive projects, the Project Finance unit of the Infrastructure Economics and Finance Department of the World Bank's Africa Energy Unit has suggested that a project leasing, or "asset financing" structure be considered as a more suitable alternative for a large-scale renewable energy infrastructure project in a developing country. Ultimately, the Merchant Bank selected to manage the international tender will be responsible for recommending the best capital structure. Finding the right financial structure is going to be a key success factor in positioning this project with international capital markets and attracting the interest of both traditional foreign investors and Islamic financial institutions.

C.2.23. Project leasing offers several advantages: (i) the financing term can may--depending on the type of equipment--exceed 20 years (unlike bank-financed project financing), thus allowing the lease to more closely match the longer payback period of the project; (ii) lease payments can be structured to take into account the seasonality of wind production, thus tailoring monthly lease payments to projected electricity generation/revenues; (iii) the assets remain off the books of the Sahara Wind IPP, thus improving their financial picture; and (iv) leasing companies retain ownership of the asset, thus reducing their financial exposure.

C.2.24. Another advantage of a leased-based approach is that it meshes particularly well with the Islamic finance instrument called “Ijarah lease”. Ijarah is an Islamic lease agreement where, instead of lending money and earning interest, the bank/leasing company earns profits by charging rentals on the asset leased to the project company. “Ijarah Wa Iqtinah” extends the concept of Ijarah to a rent and purchase agreement. By designing a "project leasing" structure that also complies with Islamic finance principles, the attractiveness of the project syndication can be greatly improved with Islamic financial institutions, thus increasing the pool of potential long-term financing sources. Once the realm of a small number of specialized institutions, Islamic finance has now moved into the mainstream, with specialized regional Islamic institutions experiencing a significant growth and global banks such as HSBC, Citibank and UBS now participating in that market.

C.2.25. It should also be noted that Morocco’s banking sector is financially sound and enjoys strong liquidity. Major foreign banks (such as the Société Générale from France) own some of the largest local institutions and can bring to bear considerable financial resources and expertise. Another positive factor is the relatively large number of leasing companies based or operating in Morocco. This situation makes the “project leasing” structure sensibly realistic and quite appealing to the extent that it could give project sponsors a larger pool of potential project financiers, both inside and outside of Morocco.

C.2.26. Moreover, a project lease approach would also allow the project sponsors to: (i) mitigate the wind risk; (ii) improve the project's economics by using certain mechanisms that have been time-tested in other countries; and (iii) to compensate for the time lag associated with the full absorption of the Tarfaya windfarm output into ONE’s existing transmission network by taking advantage of Morocco's existing interconnection with Spain to enter into innovative "free-wheeling contracts" or wind energy swap agreements (or use netting agreements) with Spanish offtakers.

C.2.27. Based on the above, the project offers Morocco a unique opportunity to take advantage of its two cable interconnections with Algeria and Spain to capitalize on the later country’s commitment and support for renewable energy assets, which is highlighted by its current regulatory framework providing significant benefits and subsidies to producers. More specifically, the objective is for renewables to account for at least 12 percent of the total supply for energy in Spain by year 2010 (the current level being 5.5 percent). This regulation which was adopted in 1998 following the European legal Framework directives and the Kyoto Protocol, in which the European Union established a commitment to increase renewable energy resources and reduce emissions of greenhouse effect gases by 8 percent by 2012. Negotiations are underway to define penalties in the event that EU countries do not meet these requirements, creating an incentive for Spain to support the directive and enter into innovative renewable energy trades with Morocco.

C.2.28. In addition to having wind studies conducted by experienced and reputable firms, wind risk mitigation could be achieved by adding a "power banking" provision that would allow the project company to "bank" any excess production over the "Annual Minimum Delivery Amount" in any year to offset production deficiencies below the annual minimum delivery amount in future years. For instance, a formula similar to the Interconnection Agreement used in Mexico for non-CFE generated offtake may help improve the project's economics. Under this mechanism, the public electricity utility, CFE, accepts energy delivery at the interconnection point near the wind generation site "when the wind blows" and delivers energy to consumers at remote sites according to consumer's load profile. This mechanism implies: (i) a virtual tracking account with the public electricity utility, based on the time-of-day value of delivered energy; and (ii) an "end-of-year netting" where the excess energy is sold to the public electricity utility at 85% of the Regional Margin Price (approx. 3.5¢/KWh in the case of

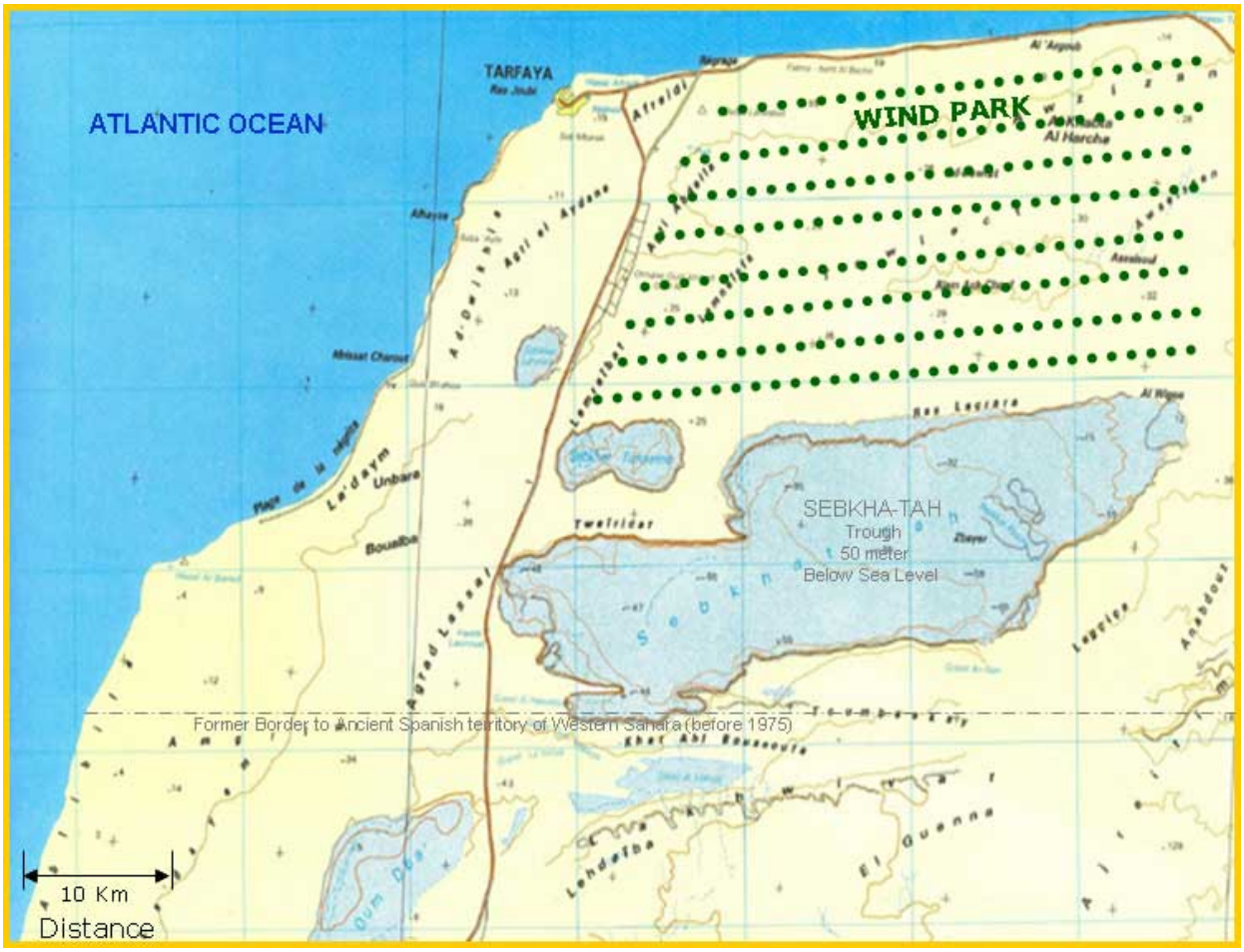
Mexico) and the energy deficit delivered by the public electricity utility to consumer at published tariff.

C.3. SUSTAINABILITY

C.3.1. Given that GEF has established on-grid renewable electricity as a key strategic priority, Sahara Wind's multi-year/multi-phase 5 GW program needs significant support from GEF in its initial stage, particularly for the full potential of the project to be realized. GEF will not be involved in future phases of the Sahara Wind Program.

C.3.2. The approach adopted in this project seeks to reinforce the long-term sustainability of the Moroccan wind electricity market on pure private sector terms. By addressing systematically and simultaneously each of the barriers currently impeding the development of commercial wind electricity in Morocco, the project will create a framework that is conducive to a sustainable market once the initial trigger conditions are met at the scale envisaged by Sahara Wind Phase 1. Project activities will strengthen capacities and foster the establishment of a transparent, liberalized environment within which all-key players and major stakeholders will have every reason to contribute their best efforts. The entire process will be supported by UNDP-GEF and the World Bank together with the African Development Bank, which already contributed US$80 million in loans to ONE to strengthen its local grid and interconnection capacity with Spain and Algeria. The above international multi-lateral partnership complemented with sizable bi-lateral involvement as suggested by the attached confirmed USTDA support will ensure greater penetration of Sahara Wind's subsequent phases output in the regional Maghreb/EU electricity market. All of the above donors have are prepared to provide sizable technical, financial and administrative assistance to the entire process as needed.

Figure 3: Illustrative Configuration of Tarfaya Wind Farm



C.3.3. By making arrangements to have the implementation of the proposed 400-500 MW wind power plant overlap with – and feed into – the launching of the forthcoming liberalized electricity spot market, the local stakeholders will ensure that the absorption capacity of the local interconnected ONE grid will not constrain the implementation of future phases. Furthermore, ONE's prior experience with Wind electricity suggests that it has a genuine interest in meeting its obligations as a TSO vis-à-vis all private Wind IPPs. Moreover, the proposed GEF activities will strengthen the operational capacities of the Power stock exchange body announced by ONE to operate its spot market segment. Morocco has a free-trade agreement with the United States of America in addition to its association accord with the EU that involves a free trade zone as well, enabling energy exchanges through existing interconnection capacity that are being significantly expanded precisely in anticipation of power trade within the Mediterranean basin.

C.3.4. With respect to the sustainability of the proposed production-based "smart-subsidy" scheme financed by GEF in tandem with the partial risk-guarantee scheme, it is key to note that such an arrangement will not be needed for the subsequent phases of Sahara Wind for the following reasons:

(i) Morocco will have acquired significant experience and will have strengthened its institutional and operational capacities tremendously at a wind electricity production scale unprecedented in the entire Maghreb region from a private sector perspective. Through the implementation of the 400-500 MW private wind plant, ONE, the CDER and the various local stakeholders will acquire concrete hands-on experience that will significantly establish the credibility of the local players;

(ii) It is now well documented by expert forecasts that the wind energy market is expected to continue to grow and result in a significant decline in wind electricity kWh cost. Wind Energy Industry analysts predict that, over the 2003-2007 period, the wind power market will register an annual growth rate above 11% while offering more reliable wind-turbines at more competitive costs. This suggests that given the economies of scale anticipated and the wind electricity market dynamics, Morocco will have positioned itself strategically in the worldwide wind electricity market;

(iii) While kWh wind electricity costs were approximately 1,500 US$ in the 1980s, they have dropped currently to around 1,000 US$/kWh; suggesting that an 18 to 25% reduction in wind electricity production cost by the year 2010 could be a realistic trend, provided similar large scale experiences are launched to boost the market.

C.3.5. Within the context of the preparation of the Tunisia 100 MW on-grid wind electricity project, UNDP-GEF carried out an investigation with the North American wind industry which indicated that a 17% cost reduction could realistically be expected between the 2001-2006 and 2007-2011 time periods. The implications for the present project are that with: (i) projected wind electricity costs around US$830/MW by 2010; (ii) the removal of institutional and regulatory barriers coupled with a liberalized electricity market connected to the EU; (iii) the building of significant local capacity under this project combined with the confirmation of an enormous industrial integration potential, the above circumstances are likely to ensure full implementation of future phases of Sahara Wind production targets on a self-sustaining commercial basis without a PBSS and partial risk guarantee schemes.

C.3.6. The explicit incorporation of a Monitoring & Evaluation component in the project will allow careful monitoring of both the performance characteristics of the wind farm and the success of the PBSS/partial risk guarantee schemes in stimulating the intended private sector investments, in order to ascertain whether or not such features could be usefully used on a more systematic basis to stimulate renewable energy generation in other parts of the world.

C.4. REPLICABILITY

C4.1. Replicability of the proposed project is ensured through Morocco's estimated Wind Electricity potential in the order of some 5 GW. The project's focus on feeding liberalized transnational electricity markets is very likely to strengthen the operational capacities of on-grid wind energy deployments worldwide. The systematic involvement and integration of the private industry in the project at an early stage is likely, given the economies of scale anticipated, to have an impact on the renewable wind energy sector as well.

C.5. STAKEHOLDER INVOLVEMENT/INTENDED BENEFICIAIRIES

C.5.1. Major project/study beneficiaries will include:

(i) the Ministry of Energy, the CDER, ONE and UNDP-Rabat which will benefit from the study's comprehensive review of the current liberalization efforts from a fresh and independent perspective with a view to addressing specific on-grid wind electricity issues. A key driver of the Sahara Wind project is the Moroccan government's stated policy to diversify its power supply base by tapping its tremendous wind potential on a self-sustaining commercial basis as confirmed by the Minister of Energy to the UNDP-GEF January 2005 PDF-B preparation mission in Rabat, Morocco. The proposed PPIAF/ESMAP grant will help build a conducive policy environment for new entry and technological, institutional and regulatory innovation;

(ii) local Moroccan electric, electro-mechanic, electronic and metallurgical industries which will be consulted and offered an opportunity to provide input to the design of the project's industrial integration component;

(iii) the local private sector and the commercial banks which will be involved in discussions of the ways in which the business environment can be further strengthened to help meet the financial needs of capital intensive renewable energy projects.

D FINANCIAL MODALITY AND COST EFFECTIVENESS

D.1. FINANCING PLAN

D.1.1. PDF-B Preparatory Phase:

Indicative Cash and in-kind contributions for PDF phase co-financing sources:

UNDP-GEF:	US$ 350,000	***(this application)***
UNDP-Morocco Field Office:	US$ 150,000	**(secured)**
ESMAP/WB:	US$ 450,000	***(under processing)***
TVIG and Partners / USTDA :	US$ 525,000	**(*secured*)**
Bilateral Co-Sponsor	US$ 403,000	***(to be determined)***
Office National de l'Electricité ONE (in-kind)**:**	US$ 42,000	**(secured)**
French Government/FASEP Program (Areva-Alstom) Ministry of Finance (DREE)	US$350,000	**(under processing)**
Centre de Developpement des Energies Renouvelables & Partners (in-kind) **:**	US$ 160,000	**(secured*)***
TOTAL:	**US$ 2,155,000**	

D.1.2. Full Project Phase

It is estimated that Full Project financing structure will be approximately:

UNDP-GEF/World Bank-GEF:	US$ 25,500,000
SPV/IPP (Private sector):	US$ 390,000,000
Total:	US$ 415,500,000

D.2. **Overall Program/Budget:** A total of **US$ 25,500,000** is proposed for this program, excluding non-GEF PDF-B resources to leverage **US$ 390,000,000** in foreign direct investment.

E. INSTITUTIONAL COORDINATION AND SUPPORT

E.1. Local coordination of the intended activities will be key to full ownership of the intended preparation phase by the majority of the stakeholders. This project appears timely in the sense that the strong emergence of civil society in recent years is a new positive dimension of the development process in Morocco, which will reinforce societal consensus towards the sustainability of the electricity sector reforms. This is particularly so, as the local environmental and economic benefits of a large-scale wind-farm are clear in a country with little or no endogenous oil resources. GEF catalytic resources will be put to good use through significant public sensitization and participatory involvement of all stakeholders. While this area is probably one of the most decisive for the country's long-term energy sector development, expectations are that the dialogue will proceed gradually as it requires much consensus building. The policy dialogue around the Sahara Wind Phase 1 / Tarfaya (400-500 MW) IPP project will be built upon a solid analytical work, inter-Ministerial coordination and targeted institutional and regulatory interventions.

E.2. What UNDP-Rabat, ONE, the CDER and the Moroccan government seek from the UNDP-GEF, the World Bank MENA Infrastructure Department and ESMAP is technical advice, deep analytical work, institution building, and a catalytic role in leveraging private financing. The roles of UNDP-GEF and the World Bank together with the African Development Bank should not be measured solely in terms of possible grant co-financing of the investment project (assuming that full project preparation is carried out successfully), but mostly in terms of their development impact and catalytic role in boosting private sector confidence in the wind electricity sector as was the case in the earlier telecommunications sector liberalization in Morocco. Progress in the Private on-grid wind electricity sector in Tunisia has set a replicable example to the Moroccan institutions.

Proposed Study Execution/Implementation Arrangements

E.3. The World Bank’s country director for Morocco has endorsed this project and a collaboration matrix with the Bank Technical Department has been agreed. Given the scope of the full project, it is proposed that both UNDP, the African Development Bank and the World Bank collaborate to manage various components of this project. The goal is to leverage the competencies and expertise of all three organizations, while engaging sufficient resources to allow for proper project oversight and management. Of particular notice is the fact that the collaboration has been extended to the African Development Bank (AfDB) Private Sector Department, which has issued a co-financing interest in the full project.

E.4. ***PDF-B Preparatory Activities:*** the following institutional responsibility scheme is proposed between the World Bank, UNDP and the African Development Bank (AfDB).

Table: Institutional Responsibility Matrix for PDF-B Preparatory Activities:

PDF-B Preparatory Activities	Primary Responsibility	
	Local Counterpart Institutions	**Donor Backstopping**
A. Technical Feasibility Study/Assessment of Site Potential	ONE/Ministry of Energy/CDER	World Bank
B. Institutional, Regulatory, Environmental and Legal Studies	ONE/Ministry of Energy/CDER	UNDP/World Bank/AfDB
C. Capacity Building and Public Awareness Raising Activities	ONE/Ministry of Energy/CDER	UNDP/World Bank
D. Monitoring and Evaluation Component	ONE/Ministry of Energy/CDER	UNDP/AfDB
E. Project Outreach and Sensitization Activities	ONE/Ministry of Energy/CDER	UNDP/AfDB
F. ESMAP Grant Management	World Bank/MENA	World Bank
G. PDF-B Project Management	UNDP-GEF	UNDP-GEF

E.5. ***Full Project Activities:*** the following institutional responsibility scheme is proposed between UNDP-GEF, the World Bank and the African Development Bank. This division of institutional responsibilities should be revised and confirmed during the PDF-B preparatory activities, when these activities will be better understood and the appropriate comparative advantage between agencies can best be determined.

Institutional Responsibility Matrix **Full Project Activities**		**Primary Responsibility**	**Anticipated GEF Grant Contribution (US$ Million)**		
			UNDP GEF Oversight	**World Bank MENA Oversight**	**Total**
I. Strengthening of Institutional, Regulatory and Operational Capacities + Power Stock Exchange Strengthening (recruitment and salary of Wind Energy Unit; real-time network monitoring equipment; spot market trading monitoring; training, promotion and targeted technical assistance; etc.)		ONE/Ministry of Energy/CDER/UNDP-GEF & World Bank-MENA	1.5	1.5	3.0
II. Wind IPP tender, bids evaluation and PBSS execution	TA/Design and Execution of International Tender/SPV and selection of Wind IPP	ONE/Ministry of Energy/World Bank-MENA		1.4	1.4
	Transfer Agent Selection and Management fees throughout 5-year PBSS life-time	ONE/Ministry of Energy/UNDP-GEF	1.4		1.4
	Establishment and Execution of Production-Based Smart Subsidy (PBSS)	ONE/Ministry of Energy/UNDP-GEF	10.5 in direct PBSS to Wind IPP		10.5 in direct PBSS to Wind IPP
III. Design and Implementation of a Partial Risk Guarantee Scheme, GEF contribution to guarantee fund (Bank to execute the IBRD Backed Partial Guarantee resources to be added)		Ministry of Energy/CDER/World Bank-MENA		6.0	6.0
IV. TA Component for Local Industry Integration		Ministry of Industry/CDER/UNDP-GEF	1.5		1.5
V. TA Component for Social and Environmental Revival of Desert Tarfaya Coastline		Ministry of Environment/UNDP-GEF	1.0		1.0
VI. Monitoring & Evaluation Component		CDER/UNDP-GEF	0.7		0.7
Total (US$ Million)			**16.6**	**8.9**	**25.5**

The World Bank Maghreb/Infrastructure Department will oversee US$8.9 million in GEF resources, primarily in the areas of operational capacity building, international tender technical assistance, and Guarantee Scheme implementation. The UNDP-GEF's allocated share of GEF resources is US$6.1 million for the above technical assistance, environmental/social assessment and capacity building activities. Given the recent UNDP-GEF's Tunisian experience of structuring a PBSS successfully, UNDP will also oversee the execution of US$10.5 million in direct PBSS to the selected Wind IPP. The above reflects both institutions' comparative advantages together with UNDP-GEF's recent wind sector experience in Tunisia and appears to be in proper balance with the World Bank's estimated allocation for US$8.9 million in overall GEF resources for the Project given that the Bank MENA team will supervise and execute the supplemental IBRD guarantee resources to be structured during project preparation/PDF-B implementation.

Steering Committee for the PDF-B Phase

E.6. A project preparation steering committee has been formed to provide guidance and senior quality control of the deliverables of the preparation activities. The steering committee is composed of a Senior Executive Manager of the Moroccan TSO (Transmission System Operator, namely ONE) and Director of planning activities of the country's power utility, a Senior Executive of the Center for Renewable Energy Development, together with other key high ranking government counterparts who will work side by side with UNDP-Rabat, the AfDB, UNDP-GEF's Regional Coordination Unit and the World Bank. The detailed composition of the Steering Committee is as follows:

(i) Noureddine Bouzaher – World Bank Infrastructure Department, MENA, WB –Washington
(ii) Mathieu-C. Koumoin – UNDP-GEF Regional Coordinator, Dakar, Senegal
(iii) Mr. Mohamed Fadili – Director of Planning Department, ONE
(iv) Mrs. Khadija Belfakir – Assistant Resident Representative, UNDP-Rabat
(v) Mr. Mohamed Berdai – Director, CDER
(vi) Mr. Taha Balafrej – Director, Ministry of Environment
(v) Mr. Jean-Pierre Ndoutom – IEPF
(vi) A representative from AMISOL
(viii) Youssef Arfaoui from AfDB, Tunis – Tunisia
(ix) Mr. Khalid Benhamou – Associate Partner with CDER.

E.7. The project steering committee will meet once quarterly with international members being required to attend meetings at least once ever 6 months. CDER will serve as the technical Secretariat of the Steering Committee, preparing all meeting agendas, minutes, MOUs and issuing invitations to convene. CDER will also be in charge of all logistical arrangements for the proposed meetings.

E.8. CORE COMMITMENTS AND LINKAGES

E.8.1. The proposed activities are consistent with UNDP-Rabat's UNDAF for Morocco.

E.9. CONSULTATION, COORDINATION AND COLLABORATION BETWEEN IAs AND Ex As.

Not applicable.

Provisional Annual Work Plan – Sahara Wind Power Development Project (Phase I)

EXPECTED OUTPUTS	KEY ACTIVITIES	TIMEFRAME					RESPONSIBLE PARTY	PLANNED BUDGET		
		1Q 07	2Q 07	3Q 07	4Q 07	1Q 08		Source of Funds	Budget Description	Amount
Component I TA-Strengthening of Institutional, Regulatory and Operational Capacities - Strengthening of Wind Electricity Actors nationwide	Recruitment and salary payment of Wind Energy Unit Staff with National Directorate of Electricity and "Green Power"	X	X	X	X	X	ONE (NEX)	UNDP-GEF		US$330,000
	Equipment acquisition and procurement of logistics (specialized software, computers, printers, GPS, office equipment and 4x4 vehicle)	X					ONE (NEX)	UNDP-GEF		US$300,000
	Real-time network monitoring equipment and systems analysis	X	X	X	X	X	ONE (DEX)	UNDP-GEF		US$1,000,000
	Spot market-power TA/equipment, trading monitoring and surveillance operations	X	X	X	X	X	ONE	WB-GEF		US$1,000,000
	Training, promotion and mission expenses of Wind Energy Unit + targeted technical assistance for renewable energy regulatory framework strengthening	X	X	X			ONE (DEX)	UNDP-GEF		US$370,000
	Total Component I									US$3,000,000

EXPECTED OUTPUTS	KEY ACTIVITIES	TIMEFRAME					RESPONSIBLE PARTY	PLANNED BUDGET		
		2007	2008	2009	2010	2011		Source of Funds	Budget Description	Amount
Component II IPP Tender Development For Access to the Open Market of ONE	Merchant Bank initial recruitment (total MB contract of US$800,000 is described on next page)	X					WB-GEF	WB-GEF/ Bank's side of the ledger		US$20,000
	Initial Development and rental of Web space on secured site for the Sahara Wind Concession including communication management with potential bidders; posting of Tarfaya site information and PDF-B reports + launch workshop	X	X				WB-GEF	WB-GEF/ Bank's side of the ledger		US$20,000
	French/English translation of key reports and tender documents to be posted on project website	X	X				WB-GEF	WB-GEF/ Bank's side of the ledger		US$40,000
	Recruitment of Web Master and MIS specialist (full time)	X	X				WB-GEF	WB-GEF/ Bank's side of the ledger		US$40,000
	Recruitment of Project Operations Assistant to carry out administrative and logistical tasks - Local Staff to support IPP Bureau/CDER/ONE Power Transmission Department	X	X				WB-GEF	WB-GEF/ Bank's side of the ledger		US$50,000
	Acquisition of Web server, printer and supplies throughout project concession award.	X	X				WB-GEF	WB-GEF/ Bank's side of the ledger		US$30,000
	Sub-Total									US$200,000

EXPECTED OUTPUTS	KEY ACTIVITIES	TIMEFRAME					RESPONSIBLE PARTY	PLANNED BUDGET		
		2007	2008	2009	2010	2011		Source of Funds	Budget Description	Amount
Component II IPP Tender Development	Merchant Bank : Preparation of TORs and technical specifications including certification of ONE avoided cost and establishment of ceiling price, definition and validation of pass-through parameters intended for the contract/access right agreement with Moroccan Power Stock Exchange	X					WB-GEF	WB-GEF/ Bank's side of the ledger		US$400,000
	Merchant Bank : Economic, financial and risk analysis and optimal allocation, determination of pass-through financial and economic parameters; finalization of all financial analysis for the wholesale rate case to be presented to the government and ONE	X					WB-GEF	WB-GEF/ Bank's side of the ledger		
	Merchant Bank : Consultative process with all relevant Ministry players, Consultation with spot market participants and ONE, IPP tender preparation/ IPP pre-qualification Potential Bidders, Planning of PR Campaigns and tender issuance.	X					WB-GEF	WB-GEF/ Bank's side of the ledger		
	Sub-Total									US$400,000
Component II IPP Bid Evaluation, Spot Market Access Negotiations and Concession Transfer Agent Selection	Merchant Bank : Bid evaluation and IPP selection		X				WB-GEF	WB-GEF		US$400,000
	Merchant Bank : Negotiation of concession contracts and Spot Market access rights		X	X			WB-GEF	WB-GEF		
	Merchant Bank : Recruitment of a Transfer Agent		X				UNDP-GEF	UNDP-GEF		
	Sub-Total									US$400,000

EXPECTED OUTPUTS	KEY ACTIVITIES	TIMEFRAME					RESPONSIBLE PARTY	PLANNED BUDGET		
		2007	2008	2009	2010	2011		Source of Funds	Budget Description	Amount
Component II PBSS Execution and Performance Monitoring	PBSS monitoring arrangements established through outsourcing (5-year arrangement) (Estimated US$80,000 per annum in Consulting fees, reporting and tariff, regulatory analysis)		X	X	X	X	WB-GEF	WB-GEF		US$400,000
	Transfer agent service fees[7] (US$280,000) per annum totaling US$1.4 million for 5 years.		X	X	X	X	UNDP-GEF	UNDP-GEF		US$1,400,000
	Cash Transfer for UNDP-GEF PBSS Resources to Wind IPP through transfer Agent		X	X	X	X	UNDP-GEF	UNDP-GEF		US$10,500,000
	Direct Disbursement through WB/UNDP-GEF Procurement -- Total Component II									US$13,300,000
Component III Design and Implementation of a Partial Risk Guarantee Scheme	Design of Partial Risk Guarantee Scheme, including financial risk analysis, legal statutes and management/supervision plan			X	X		WB-GEF	WB-GEF		US$6,000,000
	Implementation, Monitoring and Management of Partial Risk Guarantee Scheme					X	WB-GEF	WB-GEF		
	Direct Disbursement through World Bank Procurement -- Total Component III									US$6,000,000

[7] A maximum annual fee of US$300,000 is expected from 2008 through 2013.

EXPECTED OUTPUTS	KEY ACTIVITIES	TIMEFRAME					RESPONSIBLE PARTY	PLANNED BUDGET		
		2007	2008	2009	2010	2011		Source of Funds	Budget Description	Amount
Component IV TA for Local Industry Integration, Capacity Absorption Planning & CDER/ ONE's Technical Assistance	Capacity absorption planning for subsequent phases		X	X			CDER (DEX)	UNDP-GEF		US$450,000
	Characterization techniques for wind farms	X	X				CDER (DEX)	UNDP-GEF		US$450,000
	Wind site optimization using WindPro (continuous)	X	X	X	X	X	CDER (DEX)	UNDP-GEF		
	Impact assessment methodologies (continuous)	X	X	X	X	X	CDER (DEX)	UNDP-GEF		
	Survey of Moroccan local manufacturers of relevance to Wind Power development	X					CDER (NEX)	UNDP-GEF		
	Business plan development for local manufactures to participate in future wind power project	X					CDER (DEX)	UNDP-GEF		US$600,000
	Local industrial integration study; summary of local industry potential and dissemination to potential bidders	X					CDER (DEX)	UNDP-GEF		
	Technical staff training/Optimal load management techniques (continuous) and specific on-grid wind farm connection equipment.	X	X	X			CDER (DEX)	UNDP-GEF		
	Total Component IV									US$1,500,000

EXPECTED OUTPUTS	KEY ACTIVITIES	TIMEFRAME					RESPONSIBLE PARTY	PLANNED BUDGET		
		2007	2008	2009	2010	2011		Source of Funds	Budget Description	Amount
Component V TA for Social and Environmental Revival of Desert Tarfaya Coastline	Design of social and environmental revival program for Tarfaya Coastline	X					UNDP-GEF	UNDP-GEF		US$1,000,000
	Communication, consultations and workshops with key stakeholders	X	X	X			UNDP-GEF	UNDP-GEF		
	Implementation of revival plan (on-going)		X	X			UNDP-GEF	UNDP-GEF		
	Total Component V									US$1,000,000
Component VI Monitoring and Evaluation Component	Design of Monitoring and Evaluation Program, based on proposed integrated work plan	X					UNDP-GEF	UNDP-GEF		US$700,000
	Implementation and Management of M&E Program	X	X	X	X	X	UNDP-GEF	UNDP-GEF		
	Reporting of progress, milestones met and identification/resolution of potential roadblocks (continuous)	X	X	X	X	X	UNDP-GEF	UNDP-GEF		
	Total Component VI									US$700,000
	Grand Total I + II + III + IV + V + VI									US$25,500,000

PART II – PROJECT DEVELOPMENT PREPARATION

A. DESCRIPTION OF PROPOSED PDF ACTIVITIES

A.1. The purpose of the PDF-B grant (US$ 2.1 million) is to fund all preparatory activities required for the validation and launch of the Sahara Wind Phase 1 / Tarfaya (400-500 MW) project. By the end of the project preparation phase, the following preparation activities for the full-scale project will have been completed:

- A GEF Project Brief for a full-size project, which addresses the activities required for identifying all aspects likely to contribute to such large wind energy developments in Morocco, has been prepared for submission to the GEF Council for consideration;
- The analytical foundation (including all required technical and economic feasibility studies) has been laid for the realization of these large commercial wind applications in Morocco;
- The modalities for future (full-size project phase) joint operations in the area of wind energy development between the UNDP and the World Bank have been designed, discussed and agreed upon;
- Indicators and a methodology for monitoring and evaluation of the GEF intervention during the implementation of the full-size project have been designed;
- Framework and implementation arrangements for the full-size project as well as a preliminary draft work plan, including time and activity schedule are agreed;
- A pool of national, regional and international consultants has been identified for implementing the full-size project;
- A better knowledge of the wind resources for some of the best sites in the country has been determined;
- A good understanding of the cost of wind resources based on these specific conditions has been obtained; and,
- National capacities in developing a wind power industry have been strengthened.

A.2. These services will be provided by competitively selected firms.

Activity A – Technical Feasibility Study/Assessment of Site Potential
Months 1 to 17
US$ 1,275,000

Wind Resource Assessment Program (US$525,000)

Objectives of the Proposed Wind Resource Assessment Program

A.3. The objective of the Wind Resource Assessment Program (WRAP) is to analyze the wind resource and determine the viability of installing a 400 MW wind farm in the region around Tarfaya, in southern Morocco. The objective should be achieved following the methodology of the scope of work provided below.

A.4. This first activity would be executed over a period of 15 months and will include all literature search, information gathering, acquisition (e.g., maps, national meteorological data, satellite data, etc.) and analysis in order to provide a good understanding of the region's wind energy resources. This will include a review of all available data collected in Morocco to date throughout this area, in particular the data bank measurements taken by private bidders for ONE's cancelled concession project in the

Tarfaya area. Wind monitoring instruments left on site by several companies will be acquired, and the measurements pursued.

A.5. Owing to the flat topography and regular winds blowing in the region, extensive wind mapping and software extrapolation techniques will be used in the wind resource assessment program. Nevertheless, the procurement and installation of approximately 12 meteorological towers (10 m to 40 m high) distributed throughout a wider area for potential site identification and pre-selection will be required. Frequent visits along with exhaustive data gathering/transfer and analysis plus periodic quality assurance and data processing will enable the identification of the sites offering the most potential for wind energy production.

A.6. The definition of potential sites will include: total installed capacity, annual energy production, energy variation vs. time of day, season, year etc. As a result, several areas with potential for large scale wind energy infrastructures (aggregating up to 5000 MW) will be identified in the preparation of a final report on wind resources assessment for presentation and approval.

Scope of Work

- Task 1: Gathering and Evaluation of Existing Data
    - Determine how, where and when any meteorological observations were made in the region of Tarfaya;
    - Review the methodology and equipment used to make these observations. If the observations are deemed valuable, then the data should be acquired;
    - Evaluate currently installed meteorological equipment available for continued observations. If there is enough information about the type of equipment being used, the instruments are in good shape, the instruments are mounted according to industry standards, the instruments are mounted according to industry standards and the equipment is installed in locations targeted because of their high wind resource then the towers should be purchased;
    - Review and acquire any other data that could be useful for the wind resource assessment in the region of Tarfaya;
    - Gather high resolution digital topographical and surface land use maps of the area.

- Task 2: Mesoscale Wind Mapping
    - Produce a wind speed and energy density map of the region of Tarfaya. The maps would be produced at a resolution of a few kilometers. (If the necessary data is available, the maps could be produced at a resolution of up to 1 km);
    - Based on the mesoscale wind speed map and the availability of existing data, select zones of high wind energy potential to be targeted for wind parks. These zones should be easily capable of holding 500 MW of installed wind energy capacity;
    - Provide a report describing the methodology of mapping, with the results of the mapping and the pre-selected zones for park construction.

- Task 3: Installation of Tower and Data Transmission

- Ensure that sufficient wind observations are available for each targeted zone by completing the existing data with the installation of wind monitoring towers in the required areas;
- Choose the number, type of equipment and height of equipment to make the required observations. The equipment should be chosen following industry standards;
- Ensure authorization is acquired to install the wind monitoring towers at these locations (land rights and structure height);
- Micro-site the wind monitoring towers on location;
- Purchase, install and commission the wind monitoring towers;
- Install, activate and provide cellular services for data transmission to the location of data analysis;
- Provide a tower commissioning report once all of the towers are installed.

- Task 4: Technical Analysis of Wind Data[8]

  - Weekly download and quality control of the data. If there is a problem with the observations or the equipment, then the Client would be alerted to avoid any loss of data;
  - Bankable meteorological reports after 6 months and 12 months of observations.

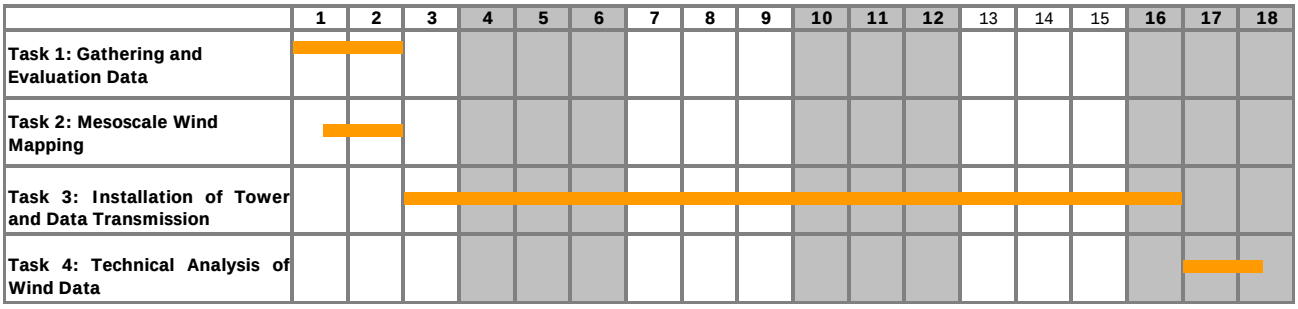
- Task 5: Assessment of Site Potential

  - Provide a preliminary assessment of wind farm site(s), including overall energy production potential, estimated utilization rate (based on wind availability), key assumptions for financial and sensitivity analysis, estimated energy production costs, and incremental cost sensitivity with respect of variations in wind energy selling price.

Schedule

A.11. The Wind Resource Assessment Program should be executed over a period of 15 months.

Expected Schedule: Wind Resource Assessment Program



[8] Both of these exhaustive meteorological reports should include the climatologically adjusted wind speed, the wind rose, the distribution of the wind speeds, the analysis of the directional distribution of energy density, vertical shear, and turbulence of the wind, graphs showing the variation of the observations with time, and finally an analysis of the diurnal wind cycles of temperature, vertical sheer and turbulence. Furthermore, the twelve month report would include: a microscale wind map of the wind speeds around each wind monitoring tower, and a climatological adjustment of the observed wind speeds with long term reference data if it is available.

Grid Impact Assessment Study (US$350,000)

A.12. Grid impact technical study (full Terms of References by ONE available at end of document)

Technical Feasibility of Supply of Wind Turbines and Optimal Production Thresholds/ Phasing (US$250,000)

A.13. The construction of the entire project, with the initial connection of the wind turbines into the Moroccan grid, will prove to be essential to improve and optimize both, sites and grid integration parameters. A thorough investigation of all industrial integration capabilities that the Moroccan industry can provide for the manufacturing of wind turbines and various other components related to the entire project will enable us to determine optimal production thresholds and phasing for the project.

A.14. The design and conception of the wind turbines used in the Sahara desert will have to take into account manufacturing considerations and specific environmental conditions under which they will operate. Cost cutting objectives and specific designs will probably eliminate costly options used in wind turbines located in densely populated areas. The economies of scale through integrated manufacturing capabilities for the production and delivery of thousands of wind turbines required to obtain an installed capacity of 5000 MW will be analyzed. In the typical 600-1800 kW size range, the largest wind turbine manufacturers currently produce about 1000 wind turbines/year. Applying such production standards to a dedicated local manufacturing plant would require about 3 years of full production for reaching the project's capacity. Lessons from the Spanish wind industry integration model will be drawn, in order to adapt them to the Moroccan context.

Coordination and Integration of Technical Feasibility Studies ($150,000)

-- Source: CDER and Partners' + ONE in-kind contribution

A.15. Given its experience and central position in the development of Morocco's electricity sector policy and strategy on renewable energy, the CDER will have full responsibility for coordinating and integrating the findings of the three technical studies listed above. The CDER will coordinate intensively with ONE and the forthcoming National Directorate for Renewable Electricity to be established within the Ministry. Likewise, owing to the reported significance of prior sensitization, local and international consensus building beyond the technical activities carried out in the region together with the need to ensure that the synergies are maximized, Sahara Wind, Inc., the initial concept developer and CDER have agreed to work together under CDER's institutional responsibility. The combined in-kind contribution expected amounts to US$160,000 per the attached co-financing letter.

Activity B – Institutional, Regulatory, Environmental and Legal Studies
Months 3 to 18
US$ 690,000

Institutional/Regulatory and Financial/Economic Intermediation (US$300,000)
-- Source: ESMAP grant + GEF + In-kind contribution from CDER & ONE

(i) Provide a comprehensive review of the Moroccan energy sector regulatory policy with a view to ***identifying all market/regulatory and institutional barriers to the development of***

on-grid wind electricity. A major reorganization of the electric power sector is on-going. This reorganization seeks to modernize the electric power public service and to gradually liberalize the market by 2005. The basic principles which should govern this reorganization, as seen by ONE, consist of: **a)** the maintenance by the State of an efficient electric power public service which will continue to guarantee access to availability and supply of electric power under the best conditions of security, quality and cost effectiveness; **b)** the disengagement of the State from all industrial activities; **c)** a partial and gradual opening up of the market to competition; and, **d)** the establishment of a regulatory mechanism. ***A prospective component of the study*** will analyze and propose ways in which outputs from Sahara Wind Phase 1 / Tarfaya (400-500 MW) IPP will be integrated into and help consolidate the envisaged liberalization efforts described in paragraph 3.4 above.

(ii) Carry out a ***retrospective analysis of current and past on-grid wind electricity experiences*** in Morocco: There have been a number of pilot wind and limited size project initiatives in Morocco, with various degrees of success and failures; and, it will be helpful to review past initiatives in detail, in order to draw a number of lessons to adapt to the proposed Sahara Wind Tarfaya (400-500 MW) scheme. This activity would provide a complete case study of the actual policy that has been initiated by ONE towards encouraging both private and its public led wind power developments schemes in Morocco. With the current liberalization of the sector, both experiences of private concessions for Wind Power through feed in tariffs and the utility's own public financed wind parks will be analyzed. The institutional and economic analysis of the wind power developments conducted in Morocco so far will have to lead to concrete perspectives that will apply to the project. Moreover, the study will suggest adequate mechanisms that are compatible with the (EU) market trends.

(iii) Carry out the ***evaluation of financial and economic returns on investing in the initial phase*** of the project (threshold to be determined through scenario analysis and absorption limit of the ONE interconnected grid); ***estimation of the optimal bid price*** for the concession of Sahara Wind Phase 1 / Tarfaya (400-500 MW) IPP.

(iv) Propose the ***financial structuring of the initial phase of the investment project***;

(v) Assess ***political risks/efficacy***;

(vi) Assess/evaluate ***alternative subsidy schemes to kick-start the local wind electricity market*** within the context of this project. In neighboring Tunisia, GEF Council approved in November 2003 a PBSS (Production-based smart subsidy) scheme over 5 years to ensure that the successful IPP bidder will yield a return commensurate with private sector expectations. A full range of subsidy schemes and innovative guarantee approaches will be explored and discussed in the final report with targeted recommendations to ensure built-in incentives for cost-effectiveness of wind power delivery and low transaction costs/administration fees.

Legal Intermediation/Due Diligence (US$160,000)
-- Source: GEF + Other bi-laterals + CDER & ONE

Ensuring process transparency and full competition

(vii) Investigate all appropriate mechanisms to determine the Sahara Wind Phase 1 / (400-500 MW) Tarfaya project development on minimum subsidy terms to ensure full competition and transparency with alternative fall-back options for the selection of the project's developers. Assess various options to preserve and compensate for the rights of the original Sahara Wind Concept Developer in ways that allow harnessing of further private participation during project preparation and implementation without loosing the transparency and efficiency gains of a well-conceived competitive tender process (intellectual/concept property right and competition).

(viii) Investigate the most appropriate corporate governance structure for ***the Special Purpose Vehicle (SPV) to lead the development of Sahara Wind Phase I project***, including an indicative equity split, and a sketch of important Board Tasks together with key elements of the shareholders covenant to promote good Board governance practices at the inception of the project based on the evaluation of Sahara Wind Inc.'s assets and its initial concept property rights.

(ix) Propose a market design that integrates the first phase of Sahara Wind ***(estimated 400-500 MW)*** into the emerging liberalized Moroccan wholesale power market which merges Sahara Wind Phase 1 / (400-500 MW) outputs with existing and previous market arrangements through a combination of specific market rules, contractual alternatives for enhancing market liquidity, contract buyout provisions, transitional financing mechanism as needed. As needed, a comprehensive analysis will be carried out to determine if ONE's assets will be stranded as a result of the forthcoming implementation of the Sahara Wind project.

(x) Make recommendations to optimize the corporate and tax structure of the proposed Sahara Wind Phase 1 project;

Securing of Sites

(xi) Review of legal provisions applicable to wind-farm land titles, registration of rights over property, permits and licenses required for wind farms, application procedures, course of procedure, documents and agencies involved, content and scope of permits and right to grid access;

Grid Access and Target Market Regime

(xii) Carry out all legal due diligence in connection with the possible adoption of a surcharge on conventionally-generated power that may be required to be devoted to paying future incremental, green-electricity production subsidies or premiums. Or a slightly different approach would be to explore the possibility of requiring, through a renewable portfolio standard (RPS), that the future local generation mixes contain a specific amount of renewable generated power. Indicative and realistic targets for the proportion of renewables by 2020 will be discussed with all stakeholders and key government counterparts with a

view to assessing whether or not such an alternative could be pursued within the context of this project.

(xiii) Recommend appropriate market access arrangements for the project developers. Owing to the on-going power sector re-structuring and liberalization, Sahara Wind's outputs for the phases subsequent to the initial project will – conceivably – have to be sold to the forthcoming energy exchange at the daily/hourly market price.

(xiv) Provide a comprehensive overview with recommendations of legal provisions to ensure efficient spot market monitoring and surveillance in the Moroccan electricity sector.

Environmental and Social Impact Assessment (ESIA)[9] (US$120,000)
-- Source: GEF + UNDP-Rabat + CDER & ONE

(xv) Analysis of the social implications of the initial phase of Sahara Wind in promoting jobs and integration of the local manufacturing.

(xvi) Comprehensive/detailed identification of local industrial actors most suitable to manufacture part of the required equipment locally and analysis of the project's economic impact in terms of a) job creation; b) foreign direct investment and multiplier effect on the aggregate economy; c) likely tariff impact on local/domestic and long-term regional electricity tariff; and d) knowledge transfer and human capital improvements, together with the overall competitiveness of the Moroccan electricity sector

(xvii) Determination of an optimal integration rate to be targeted by the project sponsors;

(xviii) Review and assessment of the options for bundling local industrial integration with tendering for the procurement of works/equipment supply/installation and consultant services;

(xix) Full Environmental Impact Assessment.

Activity C – Capacity Building and Public Awareness Raising Activities
Months 6 to 18
US$ 80,000
-- Source: ESMAP + Other bi-laterals

A.16. Under the proposed ESMAP grant, two workshops are planned to discuss preliminary findings of the proposed studies. A national 3 day workshop bringing together all local participants and Experts together with key policy players (estimated cost of the event, preparation, execution with resource persons/facilitators approximating **US$17,000**) and an International 3-day workshop within the broader regional context and looking at worldwide best practices (estimated cost around **US$33,000**).

Activity D – Monitoring and Evaluation Component
Months 6 to 18

[9] French version of TOR attached in Annex V

US$ 100,000
-- Source: GEF

(i) Design of a project monitoring and evaluation framework covering all relevant aspects of the project (monitoring and evaluation process, management and execution team structure, roles and responsibilities, issue escalation and decision making approach, performance metrics) to be applied to increase the operational capacity of ONE and the CDER;

(ii) Definition of a set of monitoring and evaluation tools and templates using the Microsoft Office suite (e.g. project plan template, action item register, project dashboard) to be used on an on-going basis;

(iii) Definition of a business case template (with clear identification of required inputs, and participants to the development of the business case) to be used to validate and justify any allocation of funds to specific investments;

(iv) Definition of a set of performance indicators to monitor technical and financial performance of the project in connection with its ownership structure.

Activity E – Project Outreach and Sensitization Activities
Months 6 to 18
US$ 155,000.
-- Source: GEF + UNDP-Rabat + ESMAP

A.17. **Participatory stakeholder involvement and sensitization (US$ 95,000).** Because of its scope, particular efforts for promoting the project will be required in order to involve at an early stage all stakeholders including the local populations, regional cooperatives, professional associations and economic operators, administrative structures, industries and government participants. Various schemes will be used to that extent, ranging from personal and regular meetings to organized seminars and/or workshops.

A.18. **Dissemination of PDF-B outputs for baseline Project Financing (US$ 60,000).** The dissemination of the results of the above investigations in all appropriate formats will be done primarily in order to raise the required financing for the baseline project. Presentations will be carried out in shareholder, finance and technical conferences. Selective releases to the media and the availability of some investigative results on the internet will assure that the project's concept also reaches a much wider audience.

Activity F – PDF-B Quality Assurance Management + Project Brief Development and Final PRODOC Preparation
Months 2 to 18
US$130,000

A.19. While CDER will manage the coordination and integration of all technical studies, ONE will oversee analysis involving the interfacing of the project with its grid. An appropriate firm/Consultant/Energy Service Provider will be selected to act as overall project manager for all other proposed PDF-B activities and to develop the project brief. The local UNDP and World Bank offices in Rabat will administer and allocate the respective ESMAP and UNDP-GEF funds.

ESMAP Grant Management Fees

A.20. An estimated US$40,000 in ESMAP grant Management fees (equivalent to 8.8% of requested amount) is requested towards the World Bank Management fees.

B. PDF BLOCK B OUTPUTS

Sector and Institutional Studies

i. prospective study of the liberalized Moroccan power market; for the purpose of integrating the project's output;
ii. the identification of all relevant aspects of the current liberalization program including: market, regulatory, institutional, legal and legislative that are likely to contribute to establishing an adequate framework for successful project implementation;
iii. institutional and economic analysis of the Wind Power developments conducted in Morocco to date, with the objective of defining a project development framework that would be compatible with (EU) market trends/mechanisms;
iv. the study of the Spanish market/grid for the purpose of integrating the project's output within the existing regulatory environment;
v. overall evaluation and prospective study of the Spanish power market within the European integration context;
vi. end-user green and sustainable energy market study, with a view to promote market entry for renewable sources in Spain with various alternatives.

Financial and Economic Feasibility Studies

vii. a financial and economic study of the project aimed at estimating the project's financial and economic rate of returns. With the on-going reform of the Moroccan power sector, we may wish to consider that an initial successful implementation of a sizeable wind power capacity injected into the liberalized market with an appropriate financing scheme will produce enough demonstration effect to trigger and sustain a purely private sector self-financed production and implementation of the required successive phases to complete the project;
viii. the economic/financial study of the first phase of the Sahara Wind project will evaluate the institutional framework and potential liberalized market that can be made available locally for power outputs, under the government of Morocco's on-going liberalization efforts in ways that would strengthen the operation of the spot/liberalized market being envisaged. The study will also include an assessment of the transparent regulatory environment with a view to promote market entry for renewable sources in Spain with various alternatives;
ix. the structuring of an optimal financial package (debt/equity and equity split together with all risk analysis and allocation and/or guarantee arrangements) along with the evaluation of rate of return on equity (ROE) for various alternative scenarios;
x. the project's industrial integration possibilities and estimated impacts for the Moroccan economy;
xi. preparation of a project brief for the first phase of the project and a prospective study for the subsequent phases.

Technical Feasibility Studies

xii. grid impact study by ONE:

- phase 1: to determine the impact of the project on the Moroccan grid and the optimal production thresholds in successive capacity installation phases of the project starting in 2006 for a total period of up to 8 years to meet the 5 GW target;
- phase 2: the impact of the project on the functioning of the grid beyond 2014, when the project and its HVDC export line are completed;

In both cases, the study will take into account local electric grid transfer capacity constraints, initial constraints related to power availability, additional power margins, existing transmission capacities to Spain, and identify various possibilities and conditions under which the project's wind energy can be injected into the grid;

xiii. the technical feasibility study for the production and supply of: a) wind turbines appropriate for the region; b) converting stations; and, c) both aerial and sea cable transmission lines with an emphasis on the preliminary design and implementation of the first phase of the project;

xiv. a comprehensive wind resource assessment program including: a) the acquisition, installation of wind speed measurement equipment in the selected sites; and, b) the regular recording and analysis of wind data over the agreed measurement period.

Social and Environmental Studies

xv. Full Environmental and Social Impact Assessment study (see TOR attached).

Monitoring and Evaluation Component

xv. Design of a project monitoring and evaluation framework (see TOR attached).

Project Outreach and Sensitization Activities

xvi. the participatory involvement and sensitization of all stakeholders including the local populations, administrative structures, industries and government participants through seminars and/or workshops;

xvii. dissemination of the results of the above investigations in all appropriate fora, primarily to raise the required financing for the baseline project.

C. JUSTIFICATION

C.1. Justification for PDF-B grant. The grant is needed due to the relative complexity of the project concept, which requires substantial project preparation efforts in order to put implementation of the full-scale project on a solid, sustainable footing.

D. TIMETABLE

D.1. The timetable below is based on a project kick-off date of May 2005, starting with the Wind Resource Assessment Program which needs to be initiated as early as possible since a full year of wind measurements is required. The calendar can be adjusted for an earlier or later start date, based on reception of GEFSEC approval.

Indicative PDF-B and PPIAF/ESMAP Grant Processing Schedule	Mar 05	Apr 05	May 05	June 05	3Q05	4Q05	1Q06	2Q06	3Q06	4Q06
GEFSEC Project Approval	X									
Selection of Consultants		X								
Mobilization of Consultants/Project Preparation			X	X						
Activity A – Technical Feasibility Studies										
Wind Resource Assessment Program			X	X	X	X	X	X	X	X
Grid Impact Assessment Study					X	X	X			
Technical Feasibility of Supply of Wind Turbines and Optimal Production Thresholds/Phasing					X	X	X	X		
Design/Feasibility Studies of Converting Stations, Arial and Sea Cables for Phase 1						X	X	X		
Coordination and Integration of Technical Feasibility Studies			X	X	X	X	X	X	X	X
Activity B – Institutional, Regulatory, Environmental and Legal Studies										
Institutional/Regulatory and Financial/Economic Intermediation					X	X	X	X		
Environmental/Social Intermediation						X	X	X		
Legal Intermediation/Due Diligence					X	X	X	X		
Activity C – Capacity Building and Public Awareness Raising Activities						X	X	X	X	
Activity D – Monitoring and Evaluation Component					X	X	X	X	X	X
Activity E – Project Outreach and Sensitization Activities										
Participatory Stakeholder Involvement and Sensitization						X	X	X	X	
Dissemination of PDF-B Outputs for Baseline Project Financing							X	X	X	
Activity F – PDF-B Quality Assurance Management + Project Brief Development		X	X	X	X	X	X	X	X	X
Project Reporting										
Interim Project Reports					X	X	X	X	X	
Final Project Report										X

E. BUDGET

E.1. The total budget for PDF-B preparatory activities is US$2,430,000, including:

	Total expenditures	UNDP-GEF (GEFSEC)	USTDA TVIG	UNDP-RABAT	ESMAP	French-Gov Fasep/DRE	Other Bi-laterals (to be dertermined)	CDER & ONE (in-kind)
A. Technical Feasibility Studies	**US$ 1,275,000**		**525,000**			**350,000**	**250,000**	**150,000**
Wind Resource Assessment Program	*US$ 525,000*		*525,000*					
Grid Impact Assessment Study	*US$ 350,000*					*350,000*		
Technical Feasibility of Supply of Wind Turbines and Optimal Production Thresholds	*US$ 250,000*						*250,000*	
Coordination and Integration of Technical Feasibility Studies (in-kind from CDER + ONE)	*US$ 150,000*							150,000
B. Institutional, Regulatory, Environmental and Legal Studies	**US$ 690,000**	**160,000**		**120,000**	**300,000**		**58,000**	**52,000**
Institutional/Regulatory and Financial/Economic Intermediation	*US$ 300,000*	*38,000*			*232,000*			*30,000*
Legal Intermediation/Due Diligence	*US$ 160,000*	*92,000*					*58,000*	*10,000*
Social Intermediation and Environmental Impact Study	*US$ 162,000*	*30,000*		*120,000*				*12,000*
International Policy Workshop	*US$…… 68,000*				68,000			
C. Capacity Building and Public Awareness Raising Activities	**US$ 80,000**				**30,000**		**50,000**	
D. Monitoring and Evaluation Component	**US$ 100,000**	**100,000**						
E. Outreach and Sensitization Activities	**US$ 155,000**	**40,000**		**20,000**	**95,000**			
Participatory stakeholder involvement and sensitization	*US $ 95,000*	*25,000*			*70,000*			
Dissemination of PDF-B outputs for baseline Project Financing	*US$ 60,000*	*15,000*		*20,000*	*25,000*			
F. PDF-B Quality Assurance Management + Project Brief Development and Final PRODOC Preparation	**US$ 130,000**	**50,000**		**10,000**	**25,000**		**45,000**	
ESMAP Grant Management fees (US$ 50,000)								
Total PDF-B Preparatory Phase	**US$ 2,430,000**	**350,000**	**525,000**	**150,000**	**450,000**	**350,000**	**403,000**	**202,000**

E.2. PDF-B co-financing includes US$525,000 from USTDA/TVIG Inc., US$150,000 from UNDP-Rabat, US$160,000 from CDER and Partners, $450,000 from the World Bank ESMAP, US$42,000 from ONE. It is anticipated that Concept and PDF-B approval by GEFSEC will trigger the confirmation of the co-financing from the French government under its FASEP Program for Morocco together with facilitating the discussions underway with the Dutch Government.

Annexes

ANNEX I: ONE PRODUCTION FIGURES (2003)

Power Generation profile

At the end of December 2002, ONE disposed of the following generation facilities:

	Installed Capacity in MW
24 Hydro Electric Plants	**1 266**
Thermal Plants	**3 189**
5 Thermal Steam Plants	2 505
Coal Fired	*1 785*
Fuel Fired	*720*
6 Natural Gas Fired Turbines	615
Conventional Diesel	69
Wind (of which 50 MW from CED*)	**54**
Total ONE	**4 509**

Energy demand in 2003:

The total energy demand was 16 779 GWH in 2003 and it has been met as follow:

	(GWH)	Share (%)
Thermal ONE	**4 321**	**25.7**
Hydro	**1 441**	**8.6**
Wind	**15**	**0.1**
Concession	**9 563**	**56.8**
JLEC (Jorf Lasfar)	9 375	55.7
CED (Wind)	188	1.1
Additional sources	**45**	**0.3**
Total exchanges	**1 438**	**8.5**
Morocco-Spain	1 455	8.6
Morocco-Algeria	-17	-0.1
Total Energy Demand	**16 823**	**100.0**

(*) CED : Compagnie Eolienne de Détroit

Production of thermal plants (Year 2003):

Fuel Type	Net Production in (GWH)	Share (%) *
Coal	**11 751**	**85.8**
Jorf Lasfar	9 375	68.5
Mohammedia	1 496	10,9
Jerada	880	6.4
Heavy Fuel	**1 929**	**14.1**
Mohammedia	1 065	7.8
Kénitra	753	5.5
Gas Turbines	75	0.5
Diesel with fuel	36	0.3
Diesel Fuel	**16**	**0.1**
Total Thermal	**13 696**	**100.0**

(*) with respect to total Thermal production

Production of hydro-electricity (Year 2003)

	Installed Capacity* (MW)	Net Production	
		GWH	Share (%)**
AHMED HANSALI-AIT MESSAOUD	98.4	37.3	2.6
BINE EL OUIDANE	135.0	90.6	6.3
AFOURER	93.6	246.8	17.1
HASSAN 1er	67.0	38.1	2.6
MOULAY YOUSSEF	24.0	14.5	1.0
AL MASSIRA	128.0	50.3	3.5
LALLA TAKERKOUST	12.0	9.4	0.7
M. EDDAHBI	10.0	10.2	0.7
EL KANSERA	14.4	27.3	1.9
OUED EL MAKHAZINE	36.0	93.7	6.5
IDRISS 1er	40.6	70.1	4.9
ALLAL EL FASSI	240.0	191.7	13.3
AL WAHDA	240.0	415.3	28.8
MOHAMMED V+BOU AREG	29.6	58.7	4.1
Divers	97.1	87.0	6.0
Total Hydro-electricity	**1 265.3**	**1 441,1**	**100.0**

(*) at maximum peak water level
(**) with respect to total Hydro-electricity production

Source ONE - 2004

ANNEX II: ONE INSTALLATION SCHEDULE FOR GENERATING FACILITIES

	Generating Capacity	In Service Date
1. Existing Facilities as of June 1, 2004:		
Hydroelectric power	1,266 MW	
Thermal	3,189 MW	
Abdelkhalek Torres-Wind farm	54 MW	
Total Existing Capacity	**4,509 MW**	
2. Facilities Under Construction:		
Hydroelectric		
Afourer STEP	463 MW	
1st group up stream plant		October 2004
1st group down stream plant		December 2004
2nd group up stream plant		February 2005
2nd group down stream plant		March 2005
Thermal		
1st combined cycle Tahaddart (Nat Gas)	400 MW	April 2005
Total Capacity Under Construction	**863 MW**	
3. Planned Facilities		
Hydroelectric		
Tanafnit-El Borj Complex	38 MW	Mid-2007
Wind farm		
Cap SIM	60 MW	1st Quarter 2006
Tangier	140 MW	1st Quarter 2007
Thermal		
Laâyoune combined cycle (141 MW)*	45 MW	End-2007
Béni Mathar Thermal Solar Energy plant	236 MW	End. 2007
2nd combined cycle of North	400 MW	End 2008-Beg 2009
LNG** (400 MW) / Coal (350 MW)	350 MW	End 2011
LNG** (400 MW) / coal (350 MW)	350 MW	End 2012
Total Planned Capacity	**1,619 MW**	
Total Installed Power Planned in 2012		
Hydroelectric and Wind farm	2,021 MW	
Thermal	4,970 MW	
Total	**6,991 MW**	

* It consists to add a TAV of 45 MW for conversion of Tan Tan's 3 TAG of 33 MW to CC After moving them to Laâyoune
** LNG: CC with liquified natural gas

ANNEX III: TERMS OF REFERENCE FOR ONE GRID IMPACT STUDY

I – OVERVIEW

Due to its significant size, the building of the generating capacity (Wind Turbines) and transport infrastructure (HVDC lines & sea cable) of the Sahara Wind project will require several years to be completed. As a consequence, it is essential to determine the optimal share of wind power that can be injected into the national grid during the various phases of the project in order to guarantee that the electricity supplied through the grid will meet appropriate requirements of safety and quality of service.

II- STRUCTURE OF THE STUDY:

All tasks making up this study will have to consider the two following phases of the project:

- 1st phase: from 2006 to 2014 when the first manufactured wind turbines will start to feed their AC power production into the national grid from the Tarfaya region;

- 2nd phase: beyond 2014 once the entire production units (wind turbines) and transport infrastructure (HVDC line with sea cable) of the project have been completed, and are available to transfer 5 GW of electricity to the Spanish Grid.

The Study will be structured in two missions:

Mission I: Impact study on grid generating requirements

Because of the intermittent nature of wind, Wind Energy is among these sources of energies that cannot be easily dispatched, since its power output cannot be guaranteed at any particular time.
Hence, the scheduling of wind power to be injected into a grid tends to induce short term differences between the expected production program, and its actual production.
To cope with these constraints, and in order to maintain a stable level of production, adequate power margins generated by conventional means must be foreseen.

The objective of the study will be to highlight:

- Evaluation of the aggregate level of equipment required, due to the use of wind power generation, and its development cost;
- Estimated impacts on operating power margins, required notably during the off-peak hours of the day

These analyses will take into account all electric export/import possibilities through existing interconnections, and load modulation enabled by the use of pumping/generating stations.
The consultant that will conduct the study will have to suggest a computer processing model establishing a link between the need to meet supply and demand for electricity within a grid, while taking into account the reliability aspect of wind parks and their impact on the grid.

<u>Mission II</u>: Study of the impact on the grid network operation.

The objective of the study is to provide an evaluation of the highest level of wind power production that can be fed into the national grid from the Tarfaya region, while respecting on one hand, the normalized limits in power fluctuation quality standards (flickers) and on the other hand, the conditions guaranteeing a stable grid operation in static and transient mode.
The tasks that will structure this study are as follow:

<u>Task 1:</u> This study will provide a detailed overview of all technical specifications available for various types of wind turbines currently on the market, with an emphasis on voltage, frequency regulation, power compensation and protection associated with the conception of wind power systems. A detailed analysis of the various disturbances (Flickers, Harmonics, Voltage Fluctuations, etc.) likely to be generated by this form of energy production will have to be conducted, along with the imbedded regulation mechanisms and means that are provided to correct them.

A particular focus will be put on specific aspects of wind power generation, such as:

- Control and regulation mechanisms of wind turbines;
- Quality of wind generated electricity;
- Distinctive features of high wind penetration grid systems and their associated management.

<u>Task 2</u>: Defining the criteria's and requirements to be used when connecting wind energy systems to the national grid. Wind Turbines are known to generate harmonics and flicker currents that represent nuisances which are injected to the grid. These can harm electrical equipments and can interfere with the functioning of other circuits, in particular in the telecommunications. Hence, it is mandatory that they remain limited to standardized levels.

The methodology applied for studying these disturbances will consist in:

- Definition of standards and norms associated with the interconnection of wind parks into the grid;
- Evaluation of the disturbances at the grid connection level with the wind parks (wave shape, handling of grid during short circuits, etc.);
- Selecting the most appropriate methods and devices enabling predefined compatibility standards to be met;
- Evaluating the costs for the various solutions suggested.

<u>Task 3</u>: Study of the continuous mode of operation:

The fluctuations of the generated wind power can have an impact on the power flows and voltage levels within a grid system. By taking into account various modes of grid operations, the study will analyze the load sharing and voltage fluctuations for a variety of cases, normal, incidental etc…
The computations of short-circuits currents will be conducted through simulations of the most constraining operating conditions. The highest and lowest values of short-circuits currents will be computed right at the grid connection point of the wind parks.

<u>Task 4:</u> Reactive power Analysis:

Since the wind power generation is prone to fluctuations due to wind gusts, it induces strong variations in the voltage profile, which creates consequently some reactive power. To manage any

sudden power release from significant amounts of wind turbines, a security margin for reactive power must be imbedded right at the wind turbine's level.

A detailed case study for these operations will be conducted in order to optimize the means of power rectifying alternatives that will have to be installed throughout the grid. A detailed cost estimate for this additional equipment will be supplied.

Task 5: Study of the grid's stability in static and transient mode of operation:

The grid stability study will have to be carried out using the software available within ONE (PSS/E, SPIRA, ERACLES) where an explicit methodology regarding the modeling of the wind turbines will have to be elaborated. The objective of the study will be to identify the major constraints affecting the dynamic behavior of the grid while fed with wind generated electricity. Appropriate solutions will be proposed in order to guarantee the stable operation of the interconnected grid network.

This analysis will be carried out in the static mode operation and for various types of incidents with in particular the following defects:

- Mono- and Tri-phased short-circuits currents over a significant amount of power lines;
- The release of the most significant generating groups;
- The release of the wind power production (with strong winds).

The analysis of the transient mode of operation will have to be conducted for sudden fluctuations of wind power generation due to high wind gusts.

The results of simulations will provide:

- An analysis of the grid fluctuations in transient mode and the reactions of the generating groups;
- The power distribution profile following the coming online of a significant amount of wind power units. A detailed attention will focus on the flows within the interconnection lines;
- The dynamic voltage variation levels;
- The evaluated impact on the critical time for eliminating short-circuits;
- A grid safety analysis.

In the event other specific problems linked to the injection of wind power are detected, additional investigations will have to be conducted in order to guarantee the adequate operation of the grid. An estimate for these induced costs will be provided.

ANNEX IV: TERMS OF REFERENCE FOR GRID IMPACT/PROJECT PHASING FEASIBILITY STUDIES

5. Technical feasibility study

5.1 Introduction

This technical feasibility study is based on a wind capacity (5 GW) installed in the region of Tarfaya. This will have to be confirmed by suitable in situ study and measuring campaign as required by the Wind Resource Assessment Program (see section 4). Should the results of that program differ significantly from the used data, the feasibility study described in this section may be reviewed.

Besides the technical feasibility, the study shall provide a reasonable implementation phasing of the project and a cost estimate of the project during these various implementation phases.

The study shall be carried out by consultant or group of consultants with proved experience in the field. Clear references and ad hoc simulation tools are required. The general conditions of this feasibility study are given in section 7.

All the points described in the sections hereunder shall be investigated.

5.2 General data

- Geographic situation
- Maximum temperature
- Minimum temperature
- Average annual temperature
- Average altitude
- Average annual precipitation
- Maximum monthly rainfall
- Minimum monthly rainfall
- Maximum annual humidity
- Minimum annual humidity
- Average annual humidity
- Maximum annual wind speed
- Minimum annual wind speed
- Average annual wind speed
- Seismic acceleration coefficient
- Pollution level

5.3 Preliminary design of the wind generation park

5.3.1 Determination of the optimal power production and phasing

Survey of the capacity of local absorption of electrical energy according to Morocco development plan
The assessed wind resources will allow the computation of the optimal power production of the selected sites. This power will be progressively injected in the grid according to:

- Local power absorption constraints
- Constraints related to the existing power transmission to Spain
- On-going reform of Morocco power sector
- Economical and financial constraints
- Other factors as determined by the study

The project will be extended over a period (starting in 2006) of 8 years reaching a target of 5000 MW. Each phase will be sized according to an appropriate financing plan and the capacity of absorption of the injected power.

The initial phase of the project shall take into account the fact that its successful implementation with appropriate site selection and feeding into the local Moroccan grid will generate income that is expected to significantly demonstrate the advantages of the coming phases.

5.3.2 Rating data

At its final stage, the Sahara Wind Project will have following basic ratings:

- Total wind generated power: 5 GW (*)
- Rated DC line voltage: +/- 500 kV (*)
- Number of bipoles : 2 (*)
- Number of DC OH lines : 2 separate
- Capacity transfer of one pole: 1250 MW (*)
- DC line distance: 1300 km
- Sea cable: 40 km
- Wind turbine life time : 20 years
- DC line life time : 40 years
- Transmission losses : 4.5 %

The wind plant shall be divided into four main areas (see drawing 1 in annex) corresponding each to the capacity of one DC pole (1250 MW). The capacity of one farm shall be approximately 100 MW (*).

5.3.3 Industrial integration of Supply of Wind Turbines

The economical impact of the project onto the local Moroccan industry is a key point of the success of the project. The manufacturing of the hundreds of wind turbines that are necessary to produce 5000 MW is one of the tools main which could be used for that.

In that case the design and conception of the wind turbines should take into account ail manufacturing considerations. The participation of the Moroccan manufacturing industry to the wind turbines and other components design and manufacturing will be considered.

However the recommendations which shall be given by the consultant or group of consultants will only be indicative as they will have to be coherent with the technical feasibility hereunder.

5.3.4 Preliminary design of the wind generator unit

5.3.4.1 Wind generator unit investigation

Survey of wind turbine manufacturers: a survey of wind turbine manufacturers is necessary to identify which are likely to potentially fulfill the specifications and the industrial integration criterion.

Type and size of individual wind generator: several types and sizes are available on the market ranging from a few kW up to a few MW. Both economical and technical criteria shall be investigated to determine the optimal size and characteristics of the wind turbine to be used (voltage level, unit power, etc.). The wind turbine will be simple in design to the extent possible in order to avoid additional costs and facilitate the participation of local industry.

Type and size of supporting tower: the type(s) and size(s) of the supporting towers will take into account both technical and economical considerations.

The design shall take into account the particular environment conditions of the region: sand, desert, sea air, temperature differences.

The preliminary design studies shall investigate the main types of wind generators, in particular:

Variable speed synchronous generators with:

- Permanent magnet or with excitation
- Series converter bridge (IGBT frequency converter) ~ low speed
- No gear box

Asynchronous (induction) machines:

- Doubly-fed generator
- Use of static frequency inverter (IGBT bridge)

Other systems can be proposed. For each of these machines, advantages and disadvantages shall be outlined.

5.3.4.2 Power conditioning basic scheme

The converted wind energy shall be conditioned before it is injected into the grid. The amount of power to be transmitted and the length of the line are clearly in favor of DG scheme. The project shall be designed based upon sound and reliable technologies and solution.

The main conditioning schemes shall be analyzed, in particular (see drawings hereunder):

- Farm output in AG (basic solution)
- Direct DG conversion (alternative 1)
- Generation at high frequency (e.g. 1000 Hz) that can reduce the weight of the equipment (alternative 2)

These alternatives shall be explored; advantages and disadvantages shall be evaluated.

5.3.5 Preliminary design of wind farm collecting grid

5.3.5.1 Wind generator grouping

For the dimensioning of the collecting and transmission grids, the study shall define:

- Size of a typical wind cluster
- Size of a typical wind farm, number of required wind farms The size of a typical area

With following meaning:

- Cluster: a group of wind generators (e.g. 25 MW) connected to the MV grid
- Farm: a group of clusters (e.g. 125 MW) connected to the sub-distribution network (e.g. 110 kV)

- Area: a group of farms, typically 1250 MW, connected to the transmission system (e.g. 400 kV).

5.3.5.2 Voltage levels

The huge wind power will be collected and injected into the local and Spanish networks through different voltage levels according to the following power conditioning schema:

- Wind generator output voltage: LV, generally 400 or 690 V
- Wind generator clusters are each connected to an internal MV ring, generally below 36 kV

The study shall determine the appropriate voltage levels taking into account both technical and economical considerations.

5.3.5.3 Preliminary design of the collecting network

The collecting (up to the farm network) grid which may reach very significant length will be adequately dimensioned according to:

- Voltage levels
- Layout
- Size and type of conductors (cables, overhead lines)
- Size of transformers
- Needs of reactive power (see hereunder)
- Type of switchgears (air or gas insulated, because of particular desert and sea environment)
- Redundancy
- Other factors as appropriate

5.4 Preliminary design of the Sub-transmission and Transmission systems

Definitions:

- Sub-transmission grid : HV network connecting different farms, generally 110 kV
- Transmission grid : VHV network connecting the different areas to the Moroccan grid and to the DC link ; typical voltage levels are 220 kV or 400 kV

5.4.1 Basic design: two AC/DC bipoles

The basic design of the transmission network architecture shall be done in such a way as to ensure that the probability to loose simultaneously more than one DC pole is very low. This implies appropriate equipment redundancy, selective protection system, etc.

The basic design shall include two DC bipoles but **any other bipole configuration involving less power shall be considered.** The selected layout(s) shall be studied on both economical and technical grounds as to dispose of both points of view.

5.4.2 Design characteristics

The transmission system shall be dimensioned taking into account to the very least:

- Implementation stages of the project
- Local needs in Morocco

- Spanish absorption capacity. And if necessary existing local (Morocco or Spain) transmission grids that will be reinforced and upgraded.

For that, the following investigations and calculations shall be carried out:

- Determination of the injected power in the local grid in Morocco (for different project stages) and characteristics of this grid
- Determination of the voltage levels
- Layout (lines, sub-stations, connecting point) of local HV and VHV grids
- Characteristics of the Spanish grid at the connecting point (s) and determination of the injected power for the different stages of the project
- Optimal sizing of the HVDC system and implementation stages:
    - Converter station rating: voltage level, reactive power, filters, firing angles, etc.
    - Converter station layout
    - Right of way of the HVDC line
    - Type of line and Conductor size
    - Insulation co-ordination
    - Neutral: metallic return, short time ground return accepted in few cases only
    - Control and operation principles of the link

5.5 Interactions with local networks - Performance studies

Given the particular situation of the Sahara Wind project (huge wind power, long DC link, low rectifier side short-circuit level,.. .etc), intensive investigations on the operating conditions of the system and its impact on both Moroccan and Spanish systems are necessary. This will be done essentially through appropriate simulations. In particular the following phenomena will be investigated:

5.5.1 Reactive power control

The HVDC needs in reactive power are approximately 60 % of the transmitted active power. This represents a huge quantity of reactive power which must be supplied by separate source because:

- Design of wind generator units must ensure an individual power factor in the range of above 0.96, i.e. the wind generators shall not be used to provide reactive power to the DC link
- Reactive power interchange between the wind plant and the Moroccan AC network will be low given the limited size of the local AC network.

Because of voltage fluctuations and in order to avoid excessive transmission losses it is generally recommended to limit such interchange.

For these reasons the necessary reactive power required to operate the DC link shall be supplied by local sources. A complete and accurate investigation of reactive power demand and a co-ordination study of the different sources (synchronous condensers, capacitor banks, filters) shall be done in order to:

- Minimize losses;
- Increase voltage stability;
- Avoid risks of resonance;
- Provide an adequate supply for the wind generators as well as the DC link.

5.5.2 Frequency control

The control of the frequency is an important function in any AC system. The study shall investigate for ail machine types (synchronous or asynchronous, fixed or variable rotational speed) the frequency

behavior of the system and the appropriate way for its control, taking into account following particular cases:

- Local AC grid is weak
- Wind plant is disconnected from the local AC network
- Taking advantages of the HVDC link

5.5.3 System stability

The stability conditions of the whole system shall be investigated. Digital simulations shall be performed to identify critical operating situations and determine stability margins. A particular attention will be paid to interactions between sub-systems:

- Wind plant with local Moroccan grid
- Wind plant with DC link
- DC link with Moroccan grid
- DC link with Spanish grid

The control of the wind turbines shall be designed such as to minimize power fluctuations and provide stable internal loops.

The system shall remain stable at minimum for the following main disturbances:

- Loss of the local Moroccan AC load (tripping of transmission line due to overload or any other reason)
- Loss of one wind generator cluster
- Loss of one farm loss of one DC pole (one area), when full power is transmitted
- Variations or loss of wind power supply due to wind speed variations
- Short-circuit on wind MV and HV grid
- Common fault on VHV AC bus bars during medium and high loads
- Switching operations of wind turbines

5.5.4 Voltage variation and control

Voltage variations and flicker: this concerns especially the Moroccan side where the short-circuit level is expected to be low. Variations in the load (or production) cause variations of the voltage at the connecting point. The voltage variations should not exceed local thresholds and the IEC recommended limits. Flicker evaluation will be based on IEC 61000-3-7.

For a good operation of the HVDC link, the voltage at the grid connection point shall be fixed and stable as far as possible. The study shall investigate the different ways to achieve that, in particular:

- For control at farm or area level SVC can be considered
- For each network configuration, the voltage control policy at ail levels and their relationships should be defined

5.5.5 Harmonic disturbances

Harmonic disturbances can be originated from both converters and wind generators. Guidelines for harmonic assessment are given in IEC 61000-3-6.

Further more any risk of anti-resonance between wind plant components (compensating devices, filters, etc.) and the AC network shall be detected and assessed.

5.5.6 Protections strategy

The protection system shall be designed and coordinated according to following zones of protections:

- Individual wind generators (generally defined by the manufacturer)
- Clusters
- Farm
- VHV and HV connecting AC systems
- DC converters
- DC link

At each zone, the parts that will be isolated to clear a fault should be specified showing the degree of grouping and redundancies. For this study, the short-circuit level will be estimated and recommendations shall be given by the consultant.

5.5.7 Controls

Active power generation and the management of its transfer to Spanish and Moroccan systems shall be explained. The related control of power and frequency for a correct operation of the system at different points should be determined. Similarly the VAR control and management policy should be defined.

The control shall be defined for different states and configurations (e.g. starting, steady state, upon loads or faults, with half the system or all, etc.).

Following control levels are used for fulfilling the overall required controls:

At wind turbine level: the turbine control and adjustment mechanisms must be capable of maintaining specified speed and output limits at ail times, both in normal operation and in extreme situations. Local disturbances (torque pulsations for instance) should be locally solved (by pitch control, static conversion). These controls are generally defined by the manufacturer.

At wind farm level: protections to be defined

At area level: it will be investigated whether a SVC is necessary or not, to control quickly the voltage level of the area.

At converter level: firing and extinction angles, DC current, dc voltage

At DC system level:

- Transformer tap changer control
- Pole control: power flow control
- Master controls
- Overall controls
- VAR production control

Power controls incorporated in the DC system:

- Frequency control: more particularly on Morocco AC (rectifier) side
- Power / frequency control
- Dynamic stabilization of AC system: necessary when the wind plant is connected to the local AC network
- Sub-synchronous resonance

- Co-ordination of active and reactive power: important because of possible changes in generated active power due to wind speed variations

5.5.8 Simulations on rectifier side

Appropriate simulation models of wind machines (turbines and generators), compensation equipment, AC (Morocco and Spain) and DC systems, main controls, shall be used to study steady state, transient and dynamic performances of the overall system. International digital programs such as EUROSTAG or EMTP or equivalent and as far as possible, real time simulator shall be used. The Spanish network shall be represented by its appropriate equivalent.

5.5.8.1 Dynamic studies

a) Starting the wind farm

- Connection of wind generators (particularly induction generators) gives rise to very high (several times the rated current) inrush currents which may cause damages to the machines and creates disturbances to the grid. Special precautions are generally taken by the manufacturers to avoid damages to the machines;

- Black starting of the wind farms and areas should be explained and related simulations should be given. The necessary equipment for implementing this step should be outlined. Coupling two AC systems is possible only if their voltage angles are equal. For that synchronizing devices are generally used;

- The protections and switchgears of the wind farms shall be designed to limit and/or withstand those starting constraints;

- The study shall determine the minimum (active power) wind machines required to be started for a good start-up of the DG link

b) Regulation

Ali regulation loops should be stable.

c) Stopping the wind farm

In case of very low wind speed or severe permanent fault, shut-down or stopping of a wind farm can be required. This could result in heavy voltage and frequency fluctuations due to the unbalance of active and reactive powers.

The study will investigate the consequences of starting and stopping operations of wind farms and appropriate remedial measures shall be proposed, in particular the following sequence shall be examined:

- Wind farm starting
- Connection to the local AC grid
- Transfer of the wind plant power output to the HVDC link
- Stopping a farm

5.5.8.2 Steady state studies

Steady state simulations shall allow checking equipment ratings in normal operation situations and possible margins (line or cable thermal limits, available active and reactive power, losses and voltage drop, etc).

5.5.8.3 Transient studies

Different faults and disturbances shall be studied, in particular:

- Load rejection (loss of a wind generator cluster, of a wind farm, an area, loss of the Moroccan local system, loss of one DC pole ...)
- Sudden increase or decrease of supplied power (because of wind speed variations)
- HV or VHV AC line switching
- Main transformer switching
- Filter switching
- Short-circuit on MV, HV, and VHV busbars
- Other factors as appropriate

The sequence modeling of the load cases shall be as follows:

- The first farm (100 MW, to be confirmed) feeding the local AC Morocco network
- This power is linearly transferred to the DC link
- Then progressively other farms will be added up to the maximum capacity of the DC link pole (1250 MW) in order to investigate the different scenarios of power transfer to Spain through one DC pole

The following issues (but not limited to) are expected from that study:

- Minimum active load required to start' the DC link
- Required reactive power for the DC converters, at different load situations the size of the filters
- Harmonization of distortion and flicker effect
- Stability behavior of the system and time responses
- Maximum frequency and voltage excursion

5.6 Availability and Reliability Study

Pertinent assumptions on equipment reliability and availability data (failure rates, time and manpower requirements, etc.) shall be done in order to determine reasonable system availability and reliability study. The following sub-systems will be considered:

- Wind plant (including the MV grid)
- HV connecting grid
- HVDC system (converters and DC line)

If necessary, detailed breakdown of these sub-systems can be done.

HVDC calculations shall be in accordance with CIGRE Study Committee 14 document 14-80 (WG04) 23. The equipment shall be divided into single system, single component or groups of components with the same function that can be then analyzed separately.

5.7 Auxiliary services

The starting and operation of the wind plant as well as the HV substations will require an important auxiliary power which must be supplied by a local AC network. The study shall determine as accurately as possible the needed power and the appropriate way to provide it.

5.8 Inverter side

As basic design the inverter shall be located preferably in Spain. However for other reasons such as the use of the existing Morocco - Spain AC link or the supply of the more industrialized Northern regions of Morocco, the consultant shall consider the possibility to install the inverter in Morocco side. The injection of the power in more than one separate point (either in Spain or in Morocco side) shall be investigated.

5.9 Operation and maintenance

The required personnel for the operation and maintenance of both wind power plant and HV (ac and dc) installations shall be estimated. The personnel expenses of such plant will have an impact on the financial balance of the project.

5.10 Phasing of the project

The consultant or group of consultants shall propose a reasonable phasing of the project which shall be confirmed by the economical and financial study. The project shall be subdivided into elementary implementation phases (typically 125 MW) as shown by figures 2 and 3 in annex.

The implementation of the different phases shall be coherent with the local Moroccan electrical energy needs and the absorption capacity of both Spain and Morocco grids. The starting phase (Phase 1) is expected to be injected into the Moroccan grid and the second phase in one DC pole.

5.11 Estimated costs of the AC and DC grids

An estimate of the costs shall be done for each implementation phase of the project taking into account the collecting, sub-transmission and transmission grids (wind generators excluded). Such estimate obtained using standard reference costs shall allow the economic and financial analysis to perform comparisons of different solutions.

6. Energy storage

The particular geographic situation of the Tarfaya region (and a depression of around 40 m depth) could enable the storage of the wind electrical energy during off load periods. In that case the water could be pumped from Sebkhat Tah basin up to the ocean and then used to produce hydro electricity during low speed wind periods.

The study will investigate:

- Available storage capacity of the basin
- Associated technical constraints
- Consequent power share with the wind plant

7. General conditions of the feasibility study

7.1 Consultant experience

The consultant will provide clear evidence of his experience (at least two significant references, each in wind farms, HVDC, SVC, network planning will be provided).

Simulating tools used will be described. CV of involved experts (at least three experts expected) shall be given.

7.2 Staff involved

Although it is the full responsibility of the consultant, it is estimated that an average of three experts should be involved full time during the whole period of the study.

7.3 Project organization

The project will be managed by a project manager who will report on a monthly basis to the customer by issuing reports on the work progress.

7.4 Kick off meeting

Two weeks after the feasibility study has been awarded, the consultant will give during a kick off meeting:

- Detailed time schedule
- Summary (table of content) of the final report
- Description of organization

During this meeting ail missing information, unclear points should be clarified.

7.5 Documentation research and procedure

The consultant will proceed in a first stage to a research on available documentation (books, articles, etc.), standards and procedures in use in different countries that have a significant experience in connecting, operating and maintaining large wind farms.

7.6 Time schedule and deliverables

This feasibility study will last six months. Expected deliverables are:

At the end of the second month (step 1)

- Documentation research and procedures
- Existing machines available on the market; advantages and disadvantages
- Modeling of the farm itself

At the end of the fourth month (step 2)

- Modeling of the entire system rectifier and inverter side
- Simulation in steady, dynamic and transient state

- Frequency and voltage control strategy

At the end of the sixth month (step 3)

- Grid design
- Operation and maintenance
- Estimated cost of the interconnection grid and DC system (cost of wind generators not included)

In a separate report: possibility of energy storage by using the larger under sea level area close to the farm areas (Sebkhat Tah)

The final report will be provided in three paper exemplars, plus three electronic copies (CD). This report will be presented to the customer in a synthetic manner by a set of slides resuming the main results.

ANNEX V: TERMS OF REFERENCE FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT[10] (DOCUMENT IN FRENCH)

1. Introduction.

1.1 Le projet Sahara Wind a reçu l'endossement du Gouvernement du Maroc ainsi que l'appui de plusieurs opérateurs du secteur, notamment l'ONE ainsi que le CDER afin d'entreprendre l'étude de faisabilité d'un parc éolien d'une capacité de 400-500 MW, dans la zone côtière de Tarfaya. Ce projet est préparé sous l'égide du Programme des Nations Unies pour le Développement (PNUD/UNDP) et du Fonds de l'Environnement Mondial (FEM/GEF) qui coordonnera l'assistance multilatérale et bilatérale requise pour mener à bien cette phase initiale, gérée sous le nom de «Sahara Wind - Phase 1 », en faisant notamment appel aux capitaux privés.

1.2 Compte tenu de ses implications environnementales dans le cadre de la réduction des gaz à effet de serre, ce projet entre dans le cadre prioritaire des actions financées par le GEF. De plus le projet répond à la stratégie énergétique du Gouvernement marocain qui vise non seulement à développer l'utilisation des énergies renouvelables mais également à réduire la dépendance du pays vis à vis des importations de combustibles fossiles. Cette stratégie est concrétisée par le projet Sahara Wind qui comporte plusieurs composantes dont : (i) la mise en place de turbines éoliennes d'une puissance totale de 400 MW avec une hauteur approximative de 50 mètres et (ii) leur raccordement au réseau électrique du pays. La première phase du projet Sahara Wind, sera implantée au sud du pays à TARFAYA, dans la zone littorale saharienne. Son coût est estimé à 415 millions de $ US dont 25 millions au titre de la contribution de l'UNDP-GEF et de 390 millions à financer par le secteur privé. Le financement est ouvert aux capitaux étrangers.

1.3 L'organisation de ce projet bénéficiera de l'expérience acquise lors de l'organisation des quatre projets précédents dont une partie a déjà été réalisée au Maroc et dont la puissance totale atteindra 253,5 MW, ainsi que d'un projet de 100 MW en cours actuellement en Tunisie avec la coopération de l'UNDP-GEF. Le premier parc éolien marocain développé par un concessionnaire privé est déjà implanté sur le site de Koudia Al Baida (Gibraltar) et génère une puissance de 50 MW ; il est entré en fonctionnement en 2000 et fournit 1,5 % de la demande en électricité du Maroc. Le second concerne un parc éolien de démonstration d'une puissance de 3,5 MW (7 turbines de 500 kW), installé par l'ONE en 2000 afin de familiariser ses techniciens avec la gestion et la maintenance des équipements. Deux autres projets auront également été construits par l'ONE sur les sites respectifs d'Essaouira (60 MW) et de Tanger (140 MW) à l'horizon 2006.

1.4 La mise en œuvre de ce projet requière la participation active des acteurs de la société civile ainsi que du secteur économique privé national et international qui seront consultés non seulement au cours de la phase de conception du projet, mais également lors de la validation de la proposition finale. Il permettra d'ancrer fermement le secteur de l'énergie éolienne dans le tissus économique du pays tout en contribuant à la réduction de sa dépendance vis à vis des produits pétroliers importés ; et intégrera les industries locales qui participeront en tant que partenaires à part entière dans le développement de cette nouvelle source d'énergie propre.

[10] "Etudes d'Impacts Environnemental et Social (EIES)" in French

1.5 Le projet contribuera ainsi à lutter contre certains facteurs de paupérisation et l'exode rural en améliorant (i) le développement régional du milieu désertique de la côte de Tarfaya, (ii) la croissance économique, (iii) le bien-être social, et (iv) la protection de l'environnement ; le projet contribuera à la création de nouveaux emplois, au développement de nouvelles PME associées aux technologies propres les plus récentes, et à la fourniture d'une énergie renouvelable sans effet négatif sur la santé (absence de dégagement gazeux polluant et de pluies acides : CO^2, SO^x, NO^x, etc.) ni sur le réchauffement de l'atmosphère. Le projet contribuera indirectement au développement de l'enseignement technologique et de nouvelles expertises, à l'émancipation et la promotion de la femme, et à la lutte contre la pauvreté.

1.6 La réalisation des études de faisabilité de ce programme est programmée sur une période de 16 mois, à dater d'Août 2004. Il comprendra principalement :

(i) des études sectorielles et institutionnelles ;
(ii) des études de faisabilité économiques et financières ;
(iii) les études de faisabilités techniques ;
(iv) une approche participative ;
(v) l'évaluation des ressources en vent de la région concernée ;
(vi) l'intermédiation environnementale et sociale ;
(vii) les aspects juridiques et institutionnels, etc.

2. L'Etude d'impacts environnemental et social (EIES).

Le cadre institutionnel et juridique de l'Environnement au Maroc.

2.1 Le Ministère de l'Environnement a été créé en février 1995 et intégré à titre transitoire en tant que Secrétariat d'Etat (SE) chargé de l'environnement au sein du Ministère de l'Agriculture, de l'Equipement et de l'Environnement, puis au Ministère de l'Aménagement du Territoire, de l'Urbanisme, de l'Habitat et de l'Environnement. Les compétences du SE à l'Environnement ont été définies dans le décret 2-99-922 de janvier 2000. Dernièrement il a été placé sous la tutelle d'un nouveau Ministère regroupant les secteurs de l'Aménagement du Territoire, de l'Eau et de l'Environnement ; l'Environnement reste placé sous l'Autorité d'un Secrétaire d'Etat. Le secrétariat général du SE à l'Environnement regroupe trois directions : (i) la direction de l'observation des études et de la coordination, (ii) la direction de la réglementation et du contrôle, (iii) la direction de la communication et de la formation continue. Au sein de la Direction de l'observation des études et de la coordination nous trouvons : (a) la division de l'observation et des études qui abrite le service des études générales et d'impacts (responsable de la collecte des EIES, de leur examen, et de la formulation des commentaires concernant la recevabilité des projets) et le laboratoire national d'étude et de surveillance des pollutions et nuisances, (b) la division de la programmation et du suivi des projets qui abrite le service du suivi des projets de développement et (c) l'Observatoire National de l'Environnement du Maroc (ONEM). La fonction de coordination du S.E. de l'environnement fait intervenir plusieurs partenaires et acteurs nationaux : (i) le Conseil National de l'Environnement (CNE), (ii) les Conseils Régionaux de l'environnement (CRE), (iii) les Conseils de l'environnement des Wilayas et des provinces (CPE).

2.2 L'arsenal juridique est actuellement incomplet et plusieurs lois-décrets sont en préparation ou déposés pour approbation. Cet arsenal comprend :

(i) la loi relative à l'obligation de réaliser des études d'impacts sur l'environnement pour les projets classés de mai 2003 ; pas de décret d'application ;

(ii) la loi relative à la protection et la mise en valeur de l'environnement ; Mai 2003 ; pas de décret d'application ;
(iii) le projet de loi relative à la gestion des déchets et leur élimination ;
(iv) le projet de loi sur le littoral

2.3 Suivant l'article 5 de la loi relative à la protection et la mise en valeur de l'environnement, il est spécifié que les études d'impact sur l'environnement auront pour buts :

(i) d'évaluer de manière systématique et préalable, les répercussions éventuelles directes et indirectes, temporaires et permanentes du projet sur l'environnement et en particulier d'évaluer ses effets sur l'homme, la faune, la flore, le sol, l'eau, l'air, le climat, le milieu naturel et les équilibres biologiques, la protection des biens et du patrimoine culturel et le cas échéant la commodité du voisinage, l'hygiène, la sécurité et la salubrité publique ainsi que la prise en compte des interactions entre ces différents facteurs ;

(ii) de supprimer les incidences négatives du projet ou de les atténuer et le cas échéant de les compenser ;

(iii) de mettre en valeur et d'améliorer les impacts positifs du projet sur l'environnement ;

(iv) d'informer la population concernée des effets négatifs du projet sur l'environnement.

L'Etude d'Impacts Environnemental et Social.

2. 4 Le projet, tel que défini, n'est pas considéré de première classe par le Dahir du 25 Août 1914 relatif aux établissements insalubres ou dangereux ; de ce fait, il ne serait pas soumis à ce jour aux dispositions du Projet de loi sur les Etudes d'impacts. Néanmoins, sur requête des organismes internationaux impliqués dans le projet et du CDER, une étude doit être menée selon les recommandations de la loi marocaine et les standards internationaux (recommandations de la Banque Mondiale et de la Banque Africaine de Développement).

2.5 Les objectifs de cette Etude d'Impacts Environnemental et Social (EIES) seront d'évaluer, dès le début du processus de développement, les effets positifs et négatifs sur le plan environnemental et social que pourrait générer la mise en œuvre du programme de développement du Parc Eolien de 400 MW. L'EIES visera également à déterminer et à proposer les moyens de réduire ou d'éviter les impacts négatifs sur l'environnement et d'accroître les bénéfices socio-économiques du projet.

2.6 Le Bureau d'Etudes, qui sera recruté pour réaliser l'étude, pourrait être amené à proposer, en les justifiant, des modifications au projet initial. Les conclusions de l'étude et ses recommandations permettront d'incorporer à la conception du projet des éléments de gestion de l'environnement et de promotion sociale qui garantiront la durabilité des activités liées au développement du secteur de l'énergie éolienne.

3. Contexte du projet.

Contexte géographique.

3.1 Le projet sera établi au sud du Maroc sur la ligne côtière aux environs de Tarfaya.

Description du projet.

3.2 Le projet consiste à ériger plusieurs centaines d'éoliennes (Aérogénérateurs) d'une puissance nominale dépassant les 1000 KW avec une hauteur de 50 mètres au niveau du rotor, afin de les connecter au réseau Marocain lui-même déjà interconnecté au réseau Espagnol. Selon les études préliminaires réalisées, la vitesse du vent au niveau du rotor serait de 7.9 m/s. Le facteur de capacité éolienne du site serait de 26 %. L'énergie renouvelable délivrée est estimée à 2.254 MWH (8.116 Gj) par turbine soit 901.774 MWh pour l'ensemble du parc soit 3.246.388 Gj.

4. Les exigences de l'EIES.

4.1 L'évaluation environnementale tiendra compte de la stratégie et des directives environnementales et d'aménagement du territoire du Gouvernement du Maroc, notamment dans le cadre (i) des dispositions visant la protection et l'exploitation des ressources naturelles et la conservation des sols, (ii) de la législation sur les zones naturelles protégées (parcs, réserves, etc.), (iii) de la loi sur les Etudes d'Impacts, (iv) du Programme d'Action National de lutte contre la désertification, et (v) de la lutte contre les facteurs de paupérisation et des dispositions visant l'amélioration de la condition de la femme. Le processus de l'étude d'impacts sera également effectué conformément aux procédures et méthodologies définies par la Banque Mondiale et la Banque Africaine de Développement et plus particulièrement dans le cadre de la réalisation des Etudes environnementales et sociales.

4.2 Le rôle du consultant titulaire sera d'assurer la totalité des tâches de l'étude, et de fournir le personnel et tous les moyens nécessaires pour garantir que toutes les exigences seront respectées. Au cas où le consultant souhaiterait sous-traiter une partie des prestations fournies, le sous-traitant devra être agréé par l'UNDP-GEF et le Comité de Pilotage au moment de l'examen des offres. Les documents et les éléments nécessaires en vue de cet agrément devront être joints à l'offre. Le consultant effectuera ses tâches sous l'autorité de l'administration marocaine conformément aux règlements et normes en vigueur au Maroc et selon les prestations figurant dans les présents Termes de Références. Pour accomplir sa mission, le consultant mettra en place le personnel prévu à la section 8. Le Maître d'Ouvrage considérera le chef de Mission du Titulaire comme interlocuteur responsable de l'ensemble du personnel du Consultant. Le personnel du Consultant se tiendra pendant toute la durée du contrat à la disposition des autorités, et gardera le secret le plus strict des tiers sur les informations, renseignements ou documents portés à sa connaissance à l'occasion de l'exercice de son mandat.

4.3 Les principaux intervenants dans l'EIES seront :

Maître d'Ouvrage : Centre des Energies Renouvelables (CDER);
Attributaire : Le Consultant titulaire.

4.5 Pour bien marquer le rôle et la limite des responsabilités du Consultant titulaire (Attributaire), il y aura lieu de se référer aux Termes de Référence de l'Etude environnementale et sociale qui établit les exigences de l'étude. Le Chef de Mission du Consultant, quant à lui, est chargé de diriger et de coordonner les activités de la mission. Il est donc responsable vis à vis du Maître d'Ouvrage de l'ensemble du personnel du consultant et de la totalité des tâches de l'étude exécutée par les agents de la mission.

5. Objectifs et portée de l'EIES.

5.1 Le contenu de l'étude inclut des investigations, énumérations et identifications détaillées des éléments de l'environnement et des populations qui pourraient être affectées par la nature des travaux et

les chantiers qui seront organisés dans le cadre du développement du projet dans la zone de Tarfaya. Ces aspects sont développés ci-dessous à titre indicatif et non limitatif. D'autres aspects pourraient interférer et devraient alors être étudiés si le besoin se faisait sentir. Si les consultants estimaient que ces aspects complémentaires sortaient du cadre de la présente étude, ils devraient le mentionner, donner les Termes de référence de l'étude recommandée et en évaluer le coût en première estimation.

5.2 Les objectifs de l'étude seront de veiller à la fois à une protection des sensibilités environnementales et sociales, et à une mise en valeur des potentialités locales grâce aux activités du projet. Il ne sera, en aucun cas, question de remettre en cause le projet lui-même, car l'investissement constitue une priorité incontournable au développement régional et national.

5.3 L'EIES mesurera le degré de transformation prévisible de l'écosystème naturel ainsi que la continuité possible ou l'amélioration des activités humaines qu'il supporte. Elle mettra l'accent sur la relation *Bénéfice à la population/Protection de l'environnement* qui conditionnera la stratégie à mettre en œuvre pour l'amélioration et la modification éventuelle du projet éolien.

5.4 Les experts qui seront chargés de l'Etude devront débuter par la collecte et l'analyse des données de base :

(i) L'identification des 2 principales composantes du projet à savoir l'installation du parc éolien et le transport de l'électricité vers le réseau local ;
(ii) L'évaluation des politiques, lois et règlements pertinents et existants en matière environnementale et sociale concernant les activités liées au projet ;
(iii) Les recommandations internationales en matière de préparation des Etudes d'impacts (Banque Mondiale et Banque Africaine de Développement)
(iv) L'identification des enjeux environnementaux, sociaux et économiques clés associés à la proposition ;
(v) L'identification des principales parties prenantes concernées par les enjeux identifiés ;
(vi) La description des expériences précédentes marocaine et tunisienne éventuellement dans le domaine éolien et les leçons qui s'imposent ;
(vii) La détermination des besoins pour l'analyse détaillée des effets potentiels des 2 composantes à savoir : les données physiques, bioclimatiques, sociales et autres, les études techniques requises, les sources d'information disponibles, les expertises requises en dehors de l'équipe assignée, etc. ;

5.5 Les experts évalueront toutes les activités humaines existantes et prévues dans la ou les zone(s) de l'étude, circonscrites au couloir ou zone géographique directement ou indirectement touchées par l'organisation du projet, à l'exclusion de toutes autres ; leurs investigations concerneront chaque secteur des activités humaines (transport, pêches, industrie, tourisme, etc.). L'étude devra identifier, inclure et décrire les sites des zones protégées à l'échelle nationale ou internationale, des zones abritant une biodiversité importante, des zones sauvages abritant des espèces endémiques, des zones déjà sensiblement dégradées, des zones présentant une valeur paysagère ou culturelle, archéologique ou religieuse.

5.6 Dans les chapitres introductifs à l'analyse des impacts, les consultants se limiteront aux descriptions et analyses physiques, écologiques, socio-économiques des seules zones d'influence des deux composantes du projet et qui seront indispensables :

(i) à établir l'état initial des sites avant le projet, et
(ii) à évaluer correctement la portée des impacts qui seront identifiés et décrits.

5.7 Les experts prendront en considération les impacts environnementaux et sociaux potentiels associés à chacune des alternatives viables, en tenant compte des différentes composantes des milieux humains et naturels ; ils détermineront la nature de chaque impact et évalueront leur probabilité et leur ampleur ; ils estimeront les impacts cumulatifs potentiels, lorsque les impacts sont reliés ou peuvent causer une combinaison d'effets. Ils identifieront les effets du projet sur l'environnement en dehors de sa zone d'action dans l'hypothèse où leur origine prendrait naissance dans la zone du projet. Les experts tiendront compte dans l'étude de toutes les relations ou interactions existantes entre sous zones ou projets existant dans la mesure où elles auraient des effets sur la conception, la viabilité, l'exploitation et l'entretien des composantes du projet éolien et du transport de l'électricité, et plus particulièrement celles qui modifient les aspects qualitatifs et quantitatifs de l'environnement.

5.8 Les résultats de l'étude se traduiront par l'élaboration d'un Plan de Gestion et de Suivi Environnemental et Social (PGES) qui ciblera chacune des 2 composantes du Projet ; il regroupera l'ensemble des recommandations basées sur l'analyse des données et informations collectées par les experts dans leur domaine spécifique et qui fera partie intégrante du rapport définitif. Les recommandations permettront de déterminer les options les plus rationnelles pour les aménagements programmés, de développer les retombées positives du projet et de mettre en place les mesures destinées à contrôler, ou atténuer les risques potentiels et les problèmes environnementaux associés à l'exécution du projet à court, moyen et long terme. Les recommandations du PGES ne doivent pas nécessairement être en accord avec celles prévues dans le cadre du projet ; l'EIES doit en effet pouvoir marquer son indépendance vis à vis de ce dernier. Dans ce cas de figure et si nécessaire, les consultants seront invités à proposer des alternatives ou modifications justifiées aux options du Plan de développement du parc éolien et à l'itinéraire du transport de l'électricité. Le Plan de Gestion Environnemental et Social sera approuvé par les Autorités concernées et la société civile avant sa finalisation et son incorporation à l'EIES. L'engagement d'en tenir compte lors de la réalisation du Programme de développement du site de Tarfaya constituera une des conditionnalités du projet.

5.9 Dans l'hypothèse où les consultants identifieraient des faiblesses au niveau des structures de gestion et de suivi de la gestion environnementale et sociale du projet, ils pourraient être amenés à proposer un Plan de renforcement institutionnel. Les initiatives à considérer, afin de renforcer la gestion environnementale et sociale, sont notamment la formation du personnel existant, l'embauche de nouveaux employés, la restructuration des unités ou agences régionales, la redéfinition des rôles et des responsabilités des intervenants.

5.10 La préparation de l'EIES nécessitera le concours d'experts de formation différente de façon à permettre l'intégration harmonieuse des objectifs socioculturels, économiques et environnementaux dans la réalisation du projet. Le Bureau d'Etudes qui sera adjudicataire fera largement appel à des expertises nationales.

6. Documentation des résultats de l'analyse environnementale et sociale.

6.1 L'étude d'impacts environnemental et social permettra d'identifier les effets potentiels du projet sur l'environnement naturel, physique et humain de la zone concernée et de déterminer les mesures requises à court, moyen et long terme (i) pour amplifier les retombées positives du projet, et (ii) pour atténuer les effets négatifs liés aux travaux de construction, au développement des différentes activités et ouvrages y afférents et entrepris dans la zone étudiée ou tributaire de la politique de désenclavement de la zone concernée. Elle s'appuiera sur les standards de qualité de l'environnement défini par la réglementation en vigueur au Maroc et dans la mesure du possible par l'Office International

de Normalisation ISO 14000 (et plus spécifiquement ISO 1440/3 - "Environmental Management Systems") et par l'EMAS (Eco Management Audit Scheme).

6.2 L'étude environnementale et sociale sera réalisée en 6 étapes qui prendront en compte les aspects suivants : (i) la description sommaire du Plan de développement et de ses extensions futures, (ii) la description du projet, (iii) l'identification et l'évaluation des impacts environnementaux et sociaux de chaque composante/alternative et des conclusions sur leur probabilité et ampleur, (iv) le résumé des consultations publiques et des avis exprimés, (v) les mesures d'atténuation et de bonification proposées, (vi) le Plan de gestion environnemental et social, (vii) éventuellement le plan de renforcement institutionnel, et (viii) la conclusion et les recommandations. L'étude sera accompagnée en tête du document d'un résumé exhaustif non technique.

6.3 Les experts exploiteront toutes les données sociales, physiques, biologiques, géologiques, disponibles pour définir les constantes et l'état de l'environnement humain et physique dans la zone concernée. Concernant les données qui pourraient manquer, ils auront l'obligation soit d'effectuer ou de sous-traiter les analyses requises, ou de recommander une Etude complémentaire s'il s'avérait que la recherche des données sortait du cadre de l'étude. Ils fourniront également un ensemble de cartes représentant les zones écologiques, les habitats naturels dignes d'attention, les sites prévus d'implantation des chantiers et des carrières ainsi que de la zone sur laquelle les actions du projet se manifesteront.

6.4 L''étude devra décrire la nature du projet, ses caractéristiques (composantes, situation, tracé retenu, dimensions) et les variantes examinées et retenues ; les consultants pourront identifier et proposer, si besoin, de nouvelles variantes dans le cadre de chaque composante, qui pourraient même se trouver sensiblement éloignées du projet initial. Ils décriront plus particulièrement les actions qui pourraient constituer des sources d'impacts sur l'environnement. Ils prendront en compte les risques relatifs à la construction du projet et au désenclavement de la région :

(i) les risques érosifs ;
(ii) les risques générés par les travaux, l'ouverture des carrières, le stockage des matériaux de construction, l'établissement des bases de vie et la production de déchets liquides et solides, la rencontre avec des infrastructures ou équipements régionaux (routes, chemin de fer, assainissement, réservoir, etc…);
(iii) les risques sismiques ;
(iv) les risques liés à la modification des structures foncières (pertes de valeur des terrains touchés par le développement du projet, expropriations, dégradation des sols privés, location de terrain), du tissu économique et social, de l'accès aux pâturages, aux conflits sociaux liés à l'arrivée d'immigrants ;
(v) les risques de dommage à la biodiversité ;
(vi) les risques culturels concernant les dommages à des sites archéologiques, historiques ou religieux et les impacts esthétiques ;
(vii) les risques tributaires du développement de la circulation routière ;
(viii) les accidents de travail, les risques sanitaires et de transmission des MST suite à l'implantation des chantiers.

6.2.3 L'identification et l'évaluation des impacts environnementaux et sociaux seront réalisées séparément pour le Parc Eolien et pour les lignes de transport aériennes d'électricité. L'analyse environnementale découlera des données recueillies auprès des Wilayas, figurant dans les études techniques, d'enquêtes auprès des habitants, de renseignements recueillis lors des visites effectuées sur les sites du projet et des discussions avec les experts de l'agence d'exécution du projet et des Ministères concernés par le projet :

i) description des effets positifs du projet, directs, indirects et induits ;
ii) description des effets négatifs du projet, directs, indirects, induits, inévitables ou irréversibles.

Phase de construction et d'exploitation.

Les experts décriront ces impacts de façon qualitative et quantitative en fonction des coûts et des avantages/désavantages pour l'environnement physique, naturel et socio-économique :

(i) les impacts seront listés, catégorisés individuellement ; ils concerneront les impacts hydrologiques, physiques, sonores (chantiers), biologiques, socio-économiques (pauvreté, questions de genre, approche participative), culturels (nomadisme inclus) et les impacts esthétiques ;
(ii) les risques seront évalués (négligeables, faibles, importants) et leurs sources identifiées ;
(iii) dans la mesure du possible des valeurs économiques et financières seront attribuées aux impacts attendus.

Les consultants préciseront les données disponibles, les informations importantes faisant défaut et les incertitudes liées à la détermination et aux prévisions de certains effets appréhendés. Dans la mesure du possible ils décriront des scénarios qui pourraient survenir d'incidents anormaux et considéreront les cas les plus désastreux. Les experts identifieront les points les plus sensibles, qui devront être plus spécifiquement surveillées.

6.2.4 Les experts conduiront des consultations adéquates auprès des parties prenantes concernées, dont les bénéficiaires potentiels, les groupes affectés, la société civile et les autorités locales, pour les informer des aspects environnementaux et sociaux du projet et pour prendre en considération leurs opinions. Elles seront conduites suivant les exigences légales du pays. Le résumé des consultations publiques et des avis exprimés par les groupes affectés par le projet et autres parties prenantes concernées, incluant les organisations de la société civile sera intégré au rapport.

6.2.5 Les experts proposeront des mesures préventives, d'atténuation ou de réduction des impacts qui concerneront (i) la phase de construction, et (ii) la phase d'exploitation du projet à court, moyen et long terme.

6.2.6 Les experts proposeront un Plan de gestion environnemental et social (PGES) qui sera réalisé en quatre étapes :

(i) Dans une première étape, les experts définiront les objectifs à atteindre en matière de qualité de l'environnement et pourront suggérer des variantes au projet, plus respectueuses de l'environnement. Les niveaux de qualité seront fixés (i) pour la pollution atmosphérique par les poussières, les dégagements gazeux, la pollution sonore des chantiers et les risques d'accidents pouvant affecter la santé humaine, les pâturages, etc., (ii) pour la reconversion des sites des chantiers après leur fermeture, (iii) pour les conditions de protection des aires réservées aux éleveurs nomades et leur accès aux pâturages ancestraux de saison hivernale, du développement du tourisme, etc. …), (iv) pour la protection de la biodiversité, (v) etc. …. La notion de diversité biologique optimale dans la zone d'exploitation sera définie.

(ii) Dans une deuxième étape, les experts définiront les ressources humaines et matérielles à mettre en œuvre, ainsi que les procédures à suivre pour réduire à la source les pollutions des chantiers et pour le maintien des objectifs de qualité qu'ils définiront en fonction des recommandations du Ministère de l'environnement ; ils se référeront également aux Textes de la Banque Africaine de développement (« Directives en matière dévaluation Environnementale ») et de la Banque Mondiale (World Bank technical paper number 139 : « Environmental Assessment Source Book » 3 volumes). Ils recommanderont des mesures d'atténuation fiables sur le plan technique, écologique et socio-économique. Ils proposeront des normes (indicateurs de performances environnementales) pour la lutte contre les différentes formes de dégradation des sites. L'EIES devra imposer au projet des mesures mitigatives qui seront en accord avec les standards internationaux (ISO 14000 et autres) quand ils existent.

(iii) Dans une troisième étape ils définiront la structure technique qui sera chargée d'exécuter le PGES et de gérer l'environnement de la zone du projet. Le programme des actions sera défini et planifié dans le temps ; il sera évalué financièrement.

(iv) Dans une quatrième étape, ils évalueront les coûts associés à l'exécution du PGES. Ils devront couvrir le maintien ou le rétablissement de la qualité de l'environnement, les besoins en formation, les indemnisations des populations qui pourraient être éventuellement lésées. Ces données pourront être prises en considération pour l'évaluation du Taux de Rentabilité Interne (TRI) économique et financier du projet.

7. Echéancier.

De commun accord, le Bureau d'Etudes et la Direction du projet établiront le calendrier de réalisation de l'EIES. La réalisation de l'étude ne devrait pas s'étendre au-delà de 3 mois calendaires.

8. Equipe d'experts et niveau d'effort.

8.1 Compte tenu de l'aspect pluridisciplinaire de l'Etude environnementale et sociale, nous suggérons, à titre indicatif, la participation des experts suivants :

(i) Un chef de projet, Expert senior en Environnement qui sera chargé de coordonner les différentes tâches assignées à l'équipe ;
(ii) Un adjoint au chef du projet, environnementaliste spécialisé en écologie ;
(iii) Un expert géologue ;
(iv) Un expert ingénieur électricien HT ;
(v) Un sociologue ou socio-économiste spécialisé dans l'examen des questions intersectorielles à savoir la réduction de la pauvreté, la promotion du statut de la femme, la dimension démographique, l'approche participative ;
(vi) Un juriste spécialisé en législation environnementale.

8.2 Chaque expert aura plus de dix ans d'expérience dans son domaine respectif et connaîtra parfaitement sur le plan professionnel les principes de l'évaluation environnementale. Une expérience professionnelle au Maroc constituerait un avantage. Ces spécialistes auront déjà participé directement ou indirectement à la préparation d'Etudes environnementales concernant des projets similaires. Ils auront une connaissance parfaite du français ; la connaissance de l'Arabe serait un avantage supplémentaire. Ils auront des connaissances pratiques en informatique (traitement de texte et tableur).

9. Présentation du rapport

9.1 Le Bureau d'Etudes travaillera en harmonie avec la Direction du Projet. Le rapport environnemental sera établi comme suit :

i) présentation d'un rapport provisoire en 5 exemplaires au Maître d'œuvre, pour commentaires ;
ii) finalisation du rapport définitif qui sera remis en 15 exemplaires et en trois versions électroniques sur CD.

9.2 Le rapport provisoire sera remis pour commentaires à l'Administration de tutelle, à l'ONE ainsi qu'au gestionnaire du projet qui en assurera la diffusion auprès des différents ministères concernés, dont le Ministère de l'Environnement, de l'Aménagement du Territoire, de l'UNDP-GEF et à la Banque Africaine de Développement, qui disposeront de 15 jours pour transmettre leurs remarques à la Direction du Projet. Les différents commentaires seront examinés par les experts du Consultant et intégrés au rapport définitif de l'EIES en fonction de leur pertinence.

9.3 Le rapport définitif de l'EIES sera présenté comme suit :

(i) Le résumé exhaustif de l'étude, en début de document ;

(ii) Le corps du rapport qui sera subdivisé en plusieurs chapitres : introduction, cadre politique légal et administratif, description et justification du plan de développement, description de l'environnement de chaque composante, solutions de rechange pour chaque composante, impacts potentiels physiques et sociaux (intégrant la promotion de la femme et la lutte contre la pauvreté) et mesures d'atténuation ou de bonification, gestion du risque environnemental, plan de gestion environnementale et sociale, consultations publiques, annexes et bibliographie ;

(iii) Les conclusions et recommandations de l'étude d'impacts qui constituent la partie la plus importante du document.

9.4 Les intitulés des différents chapitres sont donnés à titre indicatif en annexe et ne se prétendent pas exhaustifs ; ils seront adaptés, par les experts, en fonction des réalités spécifiques du projet éolien et des données recueillies. Les experts maintiendront un équilibre interne dans le rapport entre l'importance relative à accorder aux différents chapitres qui traitent des données générales et les chapitres spécifiques qui analysent les impacts du projet, leur compensation et la gestion environnementale du projet. Les chapitres généraux ne présenteront que les données requises à la compréhension de l'analyse des impacts ; ils seront concis et précis. Les experts éviteront tout développement superflu de nature académique pour s'en tenir aux faits et non à la présentation d'un cours d'environnement.

9.5 Le rapport définitif sera remis aux agences citées précédemment ; sa publication sera annoncée par voie de presse et il sera communiqué à toute agence ou organisation nationale ou internationale, ONG, coopération bilatérale, etc. qui en manifesterait le souhait.

PROCEDURE DE PREPARATION DE
L'ETUDE D'IMPACTS ENVIRONNEMENTAL ET SOCIAL

RESUME. Le résumé s'adressera à toute personne désirant se documenter rapidement sur la teneur du projet, sa conception et ses avantages techniques, les effets attendus sur l'environnement naturel et humain, etc. Il sera présenté de façon claire et concise ; il abordera les différentes parties du rapport environnemental et social suivant une approche simple et non technique permettant la compréhension de l'étude par des personnes n'ayant pas de connaissances techniques particulières.

1. Introduction. On présentera un bref aperçu historique de la genèse du projet, son statut administratif, son coût, son échéancier, mais aussi son aspect novateur et les avantages que le Maroc en tirera d'un point de vue environnemental, social et énergétique. On mentionnera également l'expérience du Maroc dans ce domaine et on la situera dans le contexte international africain.

2. Description du projet : Le Contractant décrira le projet et ses deux composantes (le parc éolien et la ligne de transport de l'électricité vers le réseau national). Il en précisera les aspects qui pourraient générer des menaces pour l'environnement naturel et humain. Il établira une comparaison avec les projets éoliens précédents et mentionnera les innovations.

(i) Expérience précédence
(ii) Objectifs du projet
(iii) Caractéristiques techniques des installations projetées
  i. Conception générale
  ii. Les ouvrages
(iv) Programme de construction
(v) Gestion des installations

2. La Législation et les aspects institutionnels.

2.1 L'Environnement.

2.1.1 Le cadre institutionnel. On mentionnera rapidement les changements intervenus au cours des 10 dernières années concernant le secteur de l'Environnement ; un organigramme sera présenté qui spécifiera sa position au sein des institutions de l'Etat (Ministères) et les responsabilités attribuées aux différentes directions qui le constituent et les délégations de pouvoir aux provinces et municipalités.

2.1.2 Le cadre législatif. Cette partie décrira le cadre législatif actuel régissant la protection des ressources naturelles, des zones à risques, des espèces menacées. On passera en revue les dispositions régulant la préparation des études d'impacts au niveau national, provincial ou municipal. Les dispositions particulières régissant le domaine de l'énergie électrique, et particulièrement les éoliennes, et le transport d'énergie seront analysées. De même les normes de qualité que le projet devra respecter seront indiquées : coupes d'arbres, pollutions engendrées par les chantiers, protection des terres agricoles et des sites classés (historiques, religieux, paysagers), etc. Les lacunes seront spécifiées.

2.2 Le cadre foncier. Les dispositions légales en matière de foncier (propriété individuelle et terres collectives, patrimoine national) seront décrites en relation avec les risques d'expropriation, de dépréciation des propriétés privées suite aux équipements qui seront installés, de dégradation de terrains lors des chantiers, des indemnisations des personnes lésées, etc.

2.3 La législation du travail. Le code du travail prévoit les mesures à prendre lors de l'organisation de différents types de chantier : préventions des accidents, organisation des bases de vie, lutte contre les différentes formes de pollution et nuisances, etc.

2.4 Les permis de construire et de réalisation. L'opérateur devra déposer auprès des Wilaya des différentes provinces traversées par le projet les dossiers réglementaires. Les entreprises choisies seront également tenues d'avertir les autorités locales.

3. Description du contexte environnemental du projet

3.1 Ce chapitre circonscrira les limites géographiques des deux composantes du projet dans lesquels les impacts se manifesteront, à l'exclusion de toute autre : les lieux d'implantation du ou des parcs éoliens (environs 400 turbines seront installées) et le couloir de passage de la ligne électrique de raccordement au réseau national. S'il existe des zones limitrophes plus ou moins éloignées à prendre en considération dans le cadre d'impacts induits ou indirects, il conviendra d'en mentionner l'étendue et les caractéristiques. Le Consultant fournira la documentation cartographique à une échelle appropriée pour situer (i) les limites géographiques des zones touchées par les impacts, (ii) les parcs éoliens et (iii) pour illustrer le tracé du couloir de la ligne de transport d'électricité ainsi que les zones environnantes susceptibles d'être affectées. Ces cartes mentionneront les zones écologiques classées, les agglomérations, les voies de communication, les eaux de surface, etc. Dans la mesure du possible, le consultant fournira une carte mentionnant les surfaces privées réellement à exproprier, de façon à illustrer l'étendue de l'impact.

3.2 Parc éolien.

(i) Localisation et coordonnées géographiques ;
(ii) Ressources physiques (Climat, Géologie – géomorphisme : informations concernant l'ancrage des éoliennes ; Hydrologie
(iii) Ressources écologiques ;
(iv) Environnement humain : population, activités économiques, foncier, infrastructures et équipements sociaux).

Les analyses seront faibles en fonction des impacts appréhendés et seront destinées à en assurer la compréhension.

3.3 Tracé de la ligne aérienne de connexion au réseau.

La délimitation de la zone à décrire et de ses ressources écologiques, humaines et socio-économiques constituera un couloir où seront localisés les impacts directs et indirects ou induits générés par le transport d'électricité. La largeur de ce couloir sera définie par le Consultant en fonction d'une analyse préliminaire des impacts potentiels et de leur dispersion.

(i) Description et localisation du tracé ;
(ii) Ressources physiques (climat, géologie et géomorphisme : informations requises pour l'ancrage des pylônes de transport d'électricité) ; hydrologie
(iii) Ressources écologiques ;
(iv) Environnement humain : population, foncier, activités économiques et emploi, niveau de pauvreté, utilisations des sols annuelle ou saisonnière (cultures, pastoralisme, forêts, jachères) ; infrastructures et équipements sociaux ; patrimoine culturel ; aspirations et comportements.

4. Description des impacts environnementaux concernant le(s) parc(s) éolien(s)

4.1 Impacts dus à la conception du projet. Les avantages et inconvénients dus au projet affecteront l'environnement naturel physique et l'environnement socio-économique. Les avantages et désavantages de la technologie pourront se résumer brièvement dans un tableau.

4.2 Impacts positifs. Ces impacts découleront directement de l'utilisation d'une énergie naturelle, non polluante et renouvelable : absence d'effet de serre, balance énergétique positive, absence de pollution gazeuse. (Oxydes de soufre et d'azote ou particules), compétition avec les stations thermiques, absence de déchets toxiques ou radioactifs, absence de perturbations irréversibles sur le site, promotion de l'emploi, impacts sur l'économie nationale dû à la mobilisation d'entreprises nationales et aux revenus générés.

4.3 Impacts négatifs. On précisera les impacts inévitables ou irréversibles.

4.3.1 Les impacts tributaires de l'organisation générale du projet concerneront essentiellement le foncier (expropriation et/ou dépréciation éventuelle de la valeur marchande des terrains), perturbation des activités humaines de proximité, perturbations écologiques et de biodiversité, impact visuel et esthétique, perturbations socio-économiques, impacts sismiques.

4.3.2 Les impacts induits par l'organisation des travaux concerneront essentiellement (i) l'installation du chantier et des dépôts de matériaux de construction, la sécurité sur le site des chantiers, l'acheminement des machines, le trafic routier, et la présence d'ouvriers et (ii) l'organisation des chantiers, la qualité de l'air (dégagements de poussières et de gaz), l'impact sonore, l'impact sur la qualité des sols (compactage) et les eaux de ruissellement et souterraines (pollution par les effluents et déchets).

4.3.3 Les impacts en phase d'exploitation des éoliennes découleront essentiellement de l'aspect visuel et esthétique et sécuritaire (risques d'accident divers) ; d'autres impacts sont identifiés : les impacts de santé pour la population (dus aux champs magnétiques et électriques), les interférences électromagnétiques, les impacts sonores et dus à la projection d'ombres, l'impact économique, les perturbations écologiques principalement sur l'avifaune, les impacts dus à une érosion potentielle sur le site, les impacts dus aux obstacles au vent qui perturberont le fonctionnement des éoliennes (puissance du vent, rugosité du terrain, effet de sillage, effet accélérateur de tunnel, etc.). Les impacts concernant la sécurité des techniciens lors des travaux de maintenance et d'entretien.

4.3.3 Les impacts en phase de démantèlement ou de fin d'exploitation. Le remplacement des éoliennes en fin de vie peut être résolu en intégrant des provisions financières au projet. Compte tenu des caractéristiques de leur implantation (fondations) les sols peuvent être totalement réhabilités dans l'hypothèse où le projet serait abandonné après quelques années.

5. Description des impacts environnementaux concernant le transport de l'électricité.

5.1 Les impacts induits par la conception du tracé. Ils concerneront essentiellement les expropriations de terrain, les prévisions d'abattage d'arbres et de traversée de forêts ou de réserves naturelles, etc. Les consultants décriront les indicateurs vérifiables de ces retombées.

5.2 Les impacts positifs se manifesteront au niveau socio-économique en termes d'emplois temporaires non spécialisés (terrassement, construction, édification des pylônes, positionnement des

câbles, travaux de conservation des sols et des eaux (CES)) qui pourra faire appel à la main d'œuvre locale. Au niveau national, la réalisation des travaux mettra à contribution des entreprises nationales et locales. Revenus injectés dans l'économie nationale. Ouverture de pistes de chantiers et désenclavement de Douars.

5.3 Les impacts négatifs.

5.3.1 Les impacts de chantier seront décrits par segment de ligne en fonction de leur catégorisation (particularité du foncier, expropriations ou dégâts aux terres de cultures, d'élevage, de steppes, de jachères, de désert sableux ou rocailleux, etc.). Trafic routier ; dépôts de matériaux de construction ; base de vie pour les ouvriers, déchets et effluents ; ouverture de chemin d'accès, tranchées dans les massifs forestiers, risques d'instabilité géologique de terrain, risques d'érosion hydrique ; impacts sur la biodiversité (dégradation localisée de formations végétales), dus aussi au tassement et compactage des sols, fragmentation et perte d'habitat pour des espèces rares ou endémiques ; dégradation des berges d'oueds traversés et perturbation de la faune, risques de pollution ; perturbation de sites de nidification ; impacts esthétiques ;

5.3.2 Les impacts en phase d'exploitation. On vérifiera si le tracé a été identifié suivant des critères de faisabilité confrontant des facteurs économiques, géographiques, de biodiversité et de sécurité. Risques d'accidents (chute accidentelle de pylône ou câbles) et d'incendies dans les cultures ou forêts. Dépréciation locale des terrains. Perturbation des activités humaines. Perturbations écologiques et de biodiversité ; risques de percussion des oiseaux principalement migrateurs, espèces concernées. Impact visuel et esthétique. Stabilité géotechnique et risques sismiques.

6. Mesures de mitigation concernant le parc éolien

Le Consultant recommandera des mesures applicables dont le coût et l'efficacité seront optimaux

6.1 Mesures de mitigation concernant l'organisation du projet. Approche participative. Acquisition des terrains et droit de passage. Correction de l'impact visuel. Travaux de conservation des eaux et sols (CES) ; maintien des activités humaines éventuelles ; conservation et protection des écosystèmes naturels ; etc.

6.2 Mesures de mitigations des activités de chantier. Organisation correcte des chantiers, élimination des déchets ; origine des matériaux de construction (carrières autorisées) ; lutte contre toute forme d'érosion ; mesures d'hygiène du travail et de sécurité ; préservation de la qualité des sols, préservation de la qualité de l'air, préservation des ressources hydriques de surface et souterraines, lutte contre les pollutions de chantier, signalisation des chantiers ; etc.

6.3 Mesures de mitigation des activités d'exploitation. Applications des mesures de sécurité accompagnant le fonctionnement des éoliennes. Balisage pour la circulation aérienne, Entretien des éoliennes et élimination des déchets ; sécurité du travail (accès de la nacelle) ; mesures palliatives contre les impacts esthétiques (couleurs) ; émissions sonores perçus comme un « bruit » ou un « son ».

6.4 Mesure de mitigation des activités de démantèlement. Sécurité dans le démontage, recyclage des matériaux y compris les huiles et les socles de fondation ; combler les excavations et remise des sols en leur état initial

7. Mesures de mitigation concernant le transport d'électricité.

7.1 Concernant les chantiers : disposition correcte des baraquements ; limitation de la durée des chantiers, limitation de la largeur du couloir emprunté pendant les travaux ; réhabilitation des sols, décapage des sols souillés ; dédommagements des personnes lésées ; humidification des pistes et matériaux pour limiter les poussières ; collecte des effluents et des déchets à évacuer dans des lieux appropriés ; entretien correct des engins de chantiers ; décalage des pylônes lors de la traversée d'infrastructures (routes, aqueducs, etc.) ; évitement des sites classés dont les SIBES ;

7.2 Concernant l'exploitation de la ligne : Pose de leurres contre les percussions d'oiseaux ; dans les couloirs de migration essentiellement ; balisage des câbles ; éventuellement déplacement du couloir ; limiter l'exposition du public aux champs magnétiques en déplaçant les lignes ou les habitations ; plantation d'arbres pour compenser les abattages ; etc.

7.3 Coût des mesures de mitigation. Présentation d'un tableau. Origine des fonds.

8. Plan de gestion environnementale et sociale (PGES).

8.1 Ce plan définira les actions spécifiques que l'opérateur entreprendra afin de mettre en œuvre les mesures de correction des impacts et de documenter la performance environnementale et sociale du projet. Ce programme permettra de suivre de près la performance des systèmes de contrôle et des programmes de modération des effets du projet afin de pouvoir documenter sa performance environnementale. Le PGES établira les procédures que l'opérateur devra suivre afin de se conformer à la législation et à la réglementation environnementale marocaine ainsi qu'aux politiques et directives de la BAD et de la WB (organisation et contrôle de la gestion des chantiers, organisation des expropriations et dédommagement, plan de gestion des impacts en phase de construction et d'exploitation et contrôle des mesures prises pour y pallier, réception environnementale des travaux, organisation de formations pour les techniciens de l'opérateur en matière de sécurité et environnement dans le cadre de la gestion du parc éolien et de leur sensibilisation en matière de protection de l'environnement et de prévention de la pollution, et du respect des règlements ; etc.)

8.2 Le PGES comprendra :

(i) Un programme de surveillance et de suivi veillera à ce que les mesures d'atténuation et de bonification soient mises en œuvre ; il permettra d'évaluer la conformité aux politiques et normes environnementales et sociales nationales et des bailleurs de fonds ;
(ii) Des propositions éventuelles de consultations publiques concernant les mesures à prendre ;
(iii) La définition des responsabilités des différents organismes impliqués et la définition des besoins institutionnels pour l'application des recommandations de l'étude d'impacts ;
(iv) L'estimation des coûts d'investissements et d'opérations relatifs aux différentes mesures à prendre ;
(v) L'échéancier de mise en œuvre des mesures proposées et la production des rapports s'y rapportant ;
(vi) L'identification d'autres acteurs requis pour garantir le suivi (besoin en formation, définition d'indicateurs de suivi, etc.).

9. Conclusions et recommandations

ANNEX VI: LETTERS OF ENDORSEMENT/INTEREST AND CO-FINANCING

MINISTER OF ENERGY

- **ENGLISH TRANSLATION**
- **FRENCH ORIGINAL**

MOROCCAN MINISTRY OF THE ENVIRONMENT

- **ENGLISH TRANSLATION**
- **FRENCH ORIGINAL**

AFRICAN DEVELOPMENT BANK GROUP

UNDP-RABAT CO-FINANCING

CENTRE DES ENERGIES RENOUVELABLES

- **ENGLISH TRANSLATION**
- **FRENCH ORIGINAL**

OFFICE NATIONAL D'ELECTRICITÉ

- **ENGLISH TRANSLATION**
- **FRENCH ORIGINAL**

TVIG/USTDA CO-FINANCING COMMITMENT

CENTRE DEVELOPPEMENT DES ENERGIES RENOUVELABLES

Rabat, le 29 OCT 2004

Royaume du Maroc

Ministère de l'Energie et des Mines

Direction de l'Energie

A

Monsieur le Représentant Résident
du Programme des Nations Unies pour le Développement

Rabat

Translated from attached original French

Dear Resident Representative,

Thank you for your fax dated October 28, 2004 in which you mention the proposed partnership with the World Bank, the UNDP/Rabat and the UNDP-GEF to develop the initial phase of a project designed to promote renewable energy in Morocco and the Mediterranean Basin and which represents the first step in assessing the feasibility of this project.

I am pleased to inform you that the Ministry of Energy and Mines is following this project very closely, in conformity with its policy of technological inquiry, and hopes that the project will result in concrete accomplishments in Morocco, as soon as the optimal conditions for its realization are put in place.

Yours sincerely,

Le Ministre de l'Energie et des Mines

Signé: Mohammed BOUTALEB

Rabat, le 29 OCT 2004

Royaume du Maroc

Ministère de l'Energie et des Mines

Direction de l'Energie

A

Monsieur le Représentant Résident
du Programme des Nations Unies pour le Développement

Rabat

Monsieur le Représentant Résident,

Nous accusons réception de votre fax du 28 octobre 2004 dans lequel vous faites mention du partenariat proposé entre la Banque Mondiale, le PNUD Rabat et le PNUD/FEM, en vue de mettre en place la phase initiale d'un projet visant la promotion des énergies renouvelables au Maroc et dans le Bassin Méditerranéen, et qui constitue une première étape permettant d'entreprendre une série d'études liées à la faisabilité de ce projet.

J'ai l'honneur de vous faire savoir que le Ministère de l'Energie et des Mines suit avec intérêt le développement de ce projet, conformément à sa politique de veille technologique, et souhaite le voir déboucher sur des réalisations concrètes au Maroc, dès que les conditions optimales de sa mise en œuvre seront réunies.

Veuillez, agréer, Monsieur le Représentant Résident, l'expression de mes sentiments distingués.

Le Ministre de l'Energie
et des Mines

Signé: Mohammed BOUTALEB

ROYAUME DU MAROC

Ministère de l'Aménagement du Territoire, de l'Eau et de l'Environnement

Secrétariat d'Etat chargé de l'Environnement

2003 مايو 23

المملكة المغربية

وزارة المكلفة بإعداد التراب الوطني و الماء و البيئة

كتابة الدولة المكلفة بالبيئة

N° 6 JBF

Translated from attached original French

Monsieur Emmanuel Dierckx de Casterlé
Représentant Résident du PNUD - Rabat -

Subject: Endorsement letter of the Sahara Wind Electricity Development Program

I am pleased to confirm that the above-mentioned project is in line with Morocco's strategy to promote renewable energies.

The project will certainly have positive impacts on the environment n Morocco by displacing sizable fossil fuel consumption and reducing air pollution. It will also have important socio-economic impacts by reducing the country's oil import expenses and creating jobs both directly and indirectly.

On the basis of the above, I should appreciate your facilitating processing and approval of the project by the Global Environment Facility (GEF).

Sincerely yours,

Abdelfetah Sahibi
Point focal operationnel du GEF

Le Chef de la Division de la Planification et de la Prospective
Signé : Abdelfetah SAHIBI

ROYAUME DU MAROC

Ministère de l'Aménagement du Territoire, de l'Eau et de l'Environnement

Secrétariat d'Etat chargé de l'Environnement

2003 23

المملكة المغربية

وزارة المكلفة بإعداد التراب الوطني و الماء و البيئة

كتابة الدولة المكلفة بالبيئة

N° 6 JEF

_/-)_

Monsieur Emmanuel Dierckx de Casterlé
Représentant Résident du PNUD - Rabat -

Objet/ -Lettre d'endossement du projet « Sahara Wind Energy development ».

*

J'ai le plaisir de vous informer que le projet mentionné en objet est en conformité avec la stratégie du Maroc visant le développement des énergies renouvelables.

Ce projet aura certainement des impacts positifs sur l'environnement du Maroc en réduisant substantiellement l'utilisation des combustibles fossiles et son impact sur la qualité de l'Air. Il aura également des impacts socio-économiques en allégeant la facture énergétique du pays et en créant des emplois directs et indirects.

Aussi vous prie-je de bien vouloir faciliter l'approbation de ce projet par les instances du G E F.

Veuillez agréer, Monsieur le Représentant Résident, l'expression de mes salutations distingées

Abdelfetah Sahibi
Point focal operationnel du GEF

Le Chef de la Division de la Planification et de la Prospective
Signé : Abdelfetah SAHIBI

AFRICAN DEVELOPMENT BANK GROUP
TEMPORARY RELOCATION AGENCY

Ref: OPSD.2/D.2-MAR/YARF
Date: 14 April 2004

Mr. Frank Pinto
Executive Coordinator, UNDP- GEF
345 East, 45th Street
New York, NY-10017
United States

Tel : 1-212-906-50-44
Fax : 1-212-906-6998
Cc/fax:1-212-658-9172

Dear Sir,

Ref : Sahara Wind project of 400 – 500 WM to Tarfaya Region, Morocco

Following our discussion with Mr. Matieu-C. Koumoin in Tunis on 30 March 2004, we would like to confirm the interest of the Private Sector Department of the Bank to consider participating in the financing of the project, subject to satisfactory conclusions of the feasibility study underway and due diligence.

Please note that this letter does not represent an offer or a commitment to provide financial resources to the project. The confirmation of Bank participation in the project will depend on the conclusions of the appraisal of the project, namely on its technical, financial, environmental and legal aspects, and the approval of such financing by ADB's Board of Directors.

We would appreciate if you could keep us informed by mail about the project phases. The officer in charge of the project is Mr. Youssef Arfaoui.

Youssef Arfaoui
Energy Expert
Private Sector Department

Tel : +216 71 10 2308
Email : y.arfaoui@afdb.org

13, Avenue du Ghana, Angle des Rues Pierre de Coubertin et Hédi Nouira - BP 323 - Tunis Belvédère 1002 - Tunisie
Tel: (216) 71 333 511 – Fax : (216) 71 351 933 – Internet: www.afdb.org

Once again, we thank you for your consideration, and look forward to hearing from you again.

Yours sincerely,

Luciano Borin
Director, Private Sector Department
tél : (216) 71 10 20 30 – fax : (216) 71 83 41 78 – e.mail : l.borin@afdb.org

Programme des Nations Unies pour le Développement

PNUD
Maroc

Rabat, January 13, 2005

Dear Frank,

Subject : Morocco: Sahara Wind Initial Phase (400-500 MW) Project

Reference is made to the following project : « **Morocco : Sahara Wind Initial Phase (400-500 MW) On-grid Electricity in a Liberalized Market** », submitted by our office for GEF funding.

I hereby confirm the commitment of UNDP – Rabat office to contribute to the PDF-B co-financing of the above-mentioned project for an amount of US $ 150.000.

Best regards,

Emmanuel Dierckx de Casterlé
Resident Representative

Mr. Frank Pinto
Executive Coordinator
UNDP-GEF
New York

Cc: Mr. Mathieu-C. Koumoin
UNDP GEF Regional Coordinator (Climate Change)
Francophone North, West and Central Africa

Angle Avenue Moulay Hassan et Rue Moulay Ahmed Loukili, Casier ONU, Rabat Chellah, Maroc
Tél. : 212 (0)37 70 35 55 – Fax : 212 (0)37 70 15 66 - Email : registry.ma@undp.org – Site web : www.pnud.org.ma

Royaume du Maroc
Centre de Développement
des Energies Renouvelables

N.Réf. : 0907 DRH/DO/CDER

Marrakech, le 22 DEC 2003

A
MONSIEUR LE DIRECTEUR
DE LA SOCIETE "SAHARA WIND"
32, RUE LALLA MERYEM - SUISSI

10100 RABAT

FAX : 037.65.08.41

Translated from attached original French

Subject: 5 GW Wind Farm " Sahara Wind Project"

Dear Managing Director

I wish to thank you for sharing with us your project document entitled "Sahara Wind Energy Development program" in connection with the preparation and future phased deployment of 5 GW along the Atlantic coastline of the Southern regions of Morocco.

I wish to extend to you CDER's congratulations on this timely initiative, which is fully consistent with the country's efforts to promote large-scale on-grid renewable energy project identification, preparation and deployments with an emphasis on wind electricity.

I would like to take this opportunity to confirm CDER's agreement to collaborate with you by making its expertise available to you for the execution of the project's Wind Resource Assessment Program (WRAP) and the precise identification of the most suitable sites.

Sincerely yours,

Le Directeur Général p.i.

Signé : Mohamed BERDAI

Royaume du Maroc
Centre de Développement
des Energies Renouvelables

المملكة المغربية
مركز تنمية الطاقات المتجددة

N.Réf. : 0907 DRH/DO/CDER

Marrakech, le 22 DEC 2003

A
MONSIEUR LE DIRECTEUR
DE LA SOCIETE "SAHARA WIND"
32, RUE LALLA MERYEM - SUISSI

10100 RABAT

FAX : 037.65.08.41

OBJET : **Projet de 5 GW de parcs éoliens "Sahara Wind Project"**

Monsieur le Directeur,

Je vous remercie d'avoir bien vouloir me remettre une copie du document relatif au projet "Sahara Wind Energy Development Project" concernant la prospection et l'évaluation d'un programme d'implantation de 5 GW de parcs éoliens tout au long des côtes atlantiques Sud du Maroc.

Je vous félicite pour cette initiative qui s'inscrit dans le cadre des efforts de promotion des énergies renouvelables au Maroc, à travers la localisation, l'évaluation et l'exploitation à grande échelle des ressources éoliennes de notre pays.

A cette occasion, je voudrais vous confirmer la disposition du CDER à œuvrer pour la réussite de cette initiative par la mobilisation de son expertise pour l'évaluation des ressources éoliennes et l'identification de sites potentiels.

Je vous prie de croire, Monsieur le Directeur, à l'expression de mes salutations distinguées.

Le Directeur Général p.i.

Signé : Mohamed BERDAI

ROYAUME DU MAROC

OFFICE NATIONAL DE L'ELECTRICITE
LE DIRECTEUR GÉNÉRAL

S999/29/2003

Casablanca, le - 9 SEP. 2003

MONSIEUR LE DIRECTEUR GENERAL
DE SAHARA WIND
32, Rue Lalla Meryem
10100 RABAT

Translated from attached original French

Dear Managing Director,

After the examining the Terms of Reference of the feasibility study for a 5 GW wind farm located in the south of the Kingdom of Morocco, we confirm our agreement to ONE's participation in the 2nd component of the study designed to assess the optimal transfer capacities of the wind energy produced by this wind farm via the national grid.

The contribution of our technical services to this study is estimated at 70 man/days, equivalent to US$42,000.

Yours sincerely,

توقيع : أحمد نقوش
Signé: Ahmed NAKKOUCH

Copie pour information à :

Mr Mathieu Koumoin

PNUD

Fax n° 1 (212)-658-9172

65, Rue Othmen Ben Affane 20000 CASA - MAROC - B.P. : 13498 - CASABLANCA 20001 - Tél. : 022.86.80.50
Télex : OFELEC 22700 M / 22603 M - Télefax : (212) 22.22.00.38 - C.C.P. Rabat / Direction : 13699 / Distribution : 65 - 61

ROYAUME DU MAROC

OFFICE NATIONAL DE L'ELECTRICITÉ
LE DIRECTEUR GÉNÉRAL

Casablanca, le - 9 SEP. 2003

S999/29/2003

MONSIEUR LE DIRECTEUR GENERAL
DE SAHARA WIND
32, Rue Lalla Meryem
10100 RABAT

Objet : Projet Sahara Wind.

Monsieur le Directeur Général,

Après examen des termes de référence de l'étude de faisabilité d'un parc éolien de 5 GW situé dans les régions du sud du Royaume du Maroc, nous vous confirmons notre accord pour une participation de l'ONE au 2éme volet de l'étude relatif à l'évaluation des capacités optimales de transfert de l'énergie éolienne produite par ce parc à travers le réseau national.

Aussi, nous vous informons que la contribution de nos services techniques à cette étude est estimée à 70 Hommes/jours soit un montant d'environ 42 000 USD.

Veuillez agréer, Monsieur le Directeur Général, l'expression de nos sentiments distingués.

توقيع : أحمد نقوش
Signé: Ahmed NAKKOUCH

Copie pour information à :
Mr Mathieu Koumoin
PNUD
Fax n° 1 (212)-658-9172

65, Rue Othman Ben Affane 20000 CASA - MAROC - B.P. : 13498 - CASABLANCA 20001 - Tél. : 022.66.80.80
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TENNESSEE VALLEY INFRASTRUCTURE GROUP, INC.

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Mr. Frank Pinto
Executive Coordinator, UNDP-GEF
East 45th Street, FF-9th Floor
New York, NY 10017
Phone: (1-212)-906-50-44
Fax: (1-212)-906-69-98

Mr. Steve Gorman
Executive Coordinator, World Bank/GEF
The World Bank
1818 H Street, N.W.; Room # MC 4-111
Washington, D.C.-20433
Phone: (1-202)-473-18-16
Fax: (1-202)-522-32-56

Date: ***January 31, 2005***

Subject: Morocco Sahara Wind 400-500 MW IPP in the Tarfaya Region – Joint UNDP-GEF/WB- GEF Submission to GEFSEC Pipeline 19: Co-financing arrangements for Wind Assessment Activities.

I am writing on behalf of Tennessee Valley Infrastructure Group, Inc., (TVIG) to confirm our intension to execute the wind resource assessment program as part of the feasibility studies of the proposed Sahara Wind 400-500 MW IPP in collaboration with UNDP-GEF, the WB-GEF, UNDP-Rabat and the relevant Moroccan counterpart institutions under the bi-lateral terms indicated in the PDF-B document. As you are aware, the intended activities are estimated to cost US$525,000 over 12 to 18 months to arrive at a comprehensive set of wind measurements and analysis towards submission by UNDP-GEF and the World Bank MENA task team of the above mentioned project to the GEF's Council for Project approval.

In reference to the terms of reference of the PDF-B proposal for this initiative, TVIG and its partner firms are working with USTDA and other US-government institutions to finalize the agreed financing arrangements for the Wind Resource Feasibility Assessment activities of the project in a timely fashion and prior to April 2005 when we expect official launching of the proposed field activities.

TVIG is prepared to deploy the resources for the field measurements by April 2005 based on the project's processing schedule for your respective institutions. We wish to assure UNDP-GEF and the World Bank-GEF that there is strong interest from the relevant US partners and USTDA. Every effort will be made to bring closure on the above financial arrangements in the weeks ahead, based on our understanding with USTDA and the current progress status of the internal US-Government processing of this case. Please consider this letter as proof of our commitment to the Sahara Wind IPP project and co-financing intent to support all required wind measurements and

technical analysis and we look forward to a mutually beneficial collaboration with GEF.

Please, do not hesitate to contact me if you require further information or otherwise.

Sincerely yours,

Richard H. Ector, CEO
TVIG, Inc.
1200 Mountain Creek Rd., Suite 410
Chattanooga, TN USA 37405
Phone: 423-266-0502
Fax: 423-267-4616
Cell: 423-240-1050
E-mail: rector@tvigroup.com
Web: www.tvigroup.com

CC: Mathieu-C. KOUMOIN, UNDP-GEF Regional Coordinator
Francophone North, West and Central Africa
Fax: (212)-658-9172

Noureddine Bouzaher, Senior Energy Economist
MNSIF Middle East and North Africa
Energy and Water Infrastructure
The World Bank Washington, D.C.
Tel: (202) 473 2853
Fax: (202)-477-1193

Pierre C. Vieillescazes
Economics & Finance Department (IEF)
Project Finance & Guarantees (PFG) &
Africa Energy Unit (AFTEG)
Tel. (202) 473-3781
Fax. (202) 473-5123
MSN # J9-900 / Room # J9-062

C. Y. Nunez-Ollero, Senior Program Officer
PPIAF Program Management Unit
C/o The World Bank.
Fax: (202)-522-7466

ROYAUME DU MAROC
CENTRE DE DEVELOPPEMENT
DES ENERGIES RENOUVELABLES

المملكة المغربية
مركز تنمية
الطاقات المتجددة

N° DRFI/CDER 0041

Marrakech, 02 FEV 2005

TO

M. Emmanuel Diercki de Casterlé
Représentant Résident
du PNUD au Maroc

Subject : Sahara Wind Project

Dear Sir,

Reference is made to the following project "Sahara Wind", submitted by UNDP-Rabat office for GEF funding.

I hereby confirm the commitment of CDER to contribute to the above project for an amount of $ 160,000 in-kind for co-ordination, following-up & management.

Best regards

Le Directeur Général p.i.

Signé : Mohamed BERDAI

CC: - M. Frank Pinto
Executive Coordinator UNDP-GEF New York

- M. Mathieu C-Koumoin
UNDP-GEF Regional Coordinator(Climate Change)
Francophone North, West and Central Africa

مراكش : زنقة المشعر الحرام إيسيل ص.ب. 509 – الهاتف : 22 / 14 98 30 044 – الفاكس : 95 97 30 044

RETScreen® Energy Model - Wind Energy Project

Site Conditions		Estimate	Notes/Range
Project name		**Sahara Wind-1**	
Project location		**Tarfaya, MA**	
Nearest location for weather data		Tarfaya	*See Weather Database*
Annual average wind speed	m/s	7.9	
Height of wind measurement	m	40.0	3.0 to 100.0
Wind shear exponent	-	0.20	0.10 to 0.25
Wind speed at 10 m	m/s	6.0	
Average atmospheric pressure	kPa	89.1	60.0 to 103.0
Annual average temperature	°C	26	-20 to 30

System Characteristics		Estimate	Notes/Range
Grid type	-	Central-grid	
Wind turbine rated power	kW	1,000	*Complete Equipment Data sheet*
Number of turbines	-	400	
Wind plant capacity	kW	400,000	
Hub height	m	50.0	6.0 to 100.0
Wind speed at hub height	m/s	8.3	3.0 to 15.0
Array losses	%	3%	0% to 20%
Airfoil soiling and/or icing losses	%	2%	1% to 10%
Other downtime losses	%	2%	2% to 7%
Miscellaneous losses	%	3%	2% to 6%

Annual Energy Production		Estimate Per turbine	Estimate Total	Notes/Range
Wind plant capacity	kW	1,000	400,000	
	MW	1	400	
Unadjusted energy production	MWh	3,291	1,316,264	
Pressure adjustment coefficient	-	0.88	0.88	0.59 to 1.02
Temperature adjustment coefficient	-	0.96	0.96	0.98 to 1.15
Gross energy production	MWh	2,780	1,111,980	
Losses coefficient	-	0.90	0.90	0.75 to 1.00
Specific yield	kWh/m²	1,097	1,097	150 to 1,500
Wind plant capacity factor	%	29%	29%	20% to 40%
Renewable energy delivered	MWh	2,512	**1,004,830**	
	GJ	9043	3617387	
				Complete Cost Analysis sheet

Version 2000 - Release 3 NRCan/CEDRL

RETScreen® Greenhouse Gas (GHG) Emission Reduction Analysis - Wind Energy Project

Use GHG analysis sheet? Yes Type of analysis Standard

Background Information

Project Information

Project name	Sahara Wind-1
Project location	Tarfaya, MA

Global Warming Potential of GHG

1 ton CH_4 =	21	tons CO_2	(IPCC 1996)
1 ton N_2O =	310	tons CO_2	(IPCC 1996)

Base Case Electricity System (Reference)

Fuel type	Fuel mix (%)	CO_2 emission factor (kg/GJ)	CH_4 emission factor (kg/GJ)	N_2O emission factor (kg/GJ)	Fuel conversion efficiency (%)	T & D losses (%)	GHG emission factor (t_{CO2}/MWh)
Coal	70.0%	94.6	0.0020	0.0030	35.0%	8.0%	1.069
Large hydro	9.8%	0.0	0.0000	0.0000	100.0%		0.000
#6 oil	11.6%	77.4	0.0030	0.0020	30.0%		0.937
Natural gas	7.0%	56.1	0.0030	0.0010	45.0%		0.452
Wind	1.7%	0.0	0.0000	0.0000	100.0%		0.000
Electricity mix	100%	244.3	0.0060	0.0075		5.6%	0.888

Proposed Case Electricity System (Mitigation)

Fuel type	Fuel mix (%)	CO_2 emission factor (kg/GJ)	CH_4 emission factor (kg/GJ)	N_2O emission factor (kg/GJ)	Fuel conversion efficiency (%)	T & D losses (%)	GHG emission factor (t_{CO2}/MWh)
Electricity system							
Wind	100.0%	0.0	0.0000	0.0000	100.0%	8.0%	0.000

GHG Emission Reduction Summary

	Base case GHG emission factor (t_{CO2}/MWh)	Proposed case GHG emission factor (t_{CO2}/MWh)	End-use annual energy delivered (MWh)		Annual GHG emission reduction (t_{CO2})
Electricity system	0.888	0.000	924,443		821,156
			Net GHG emission reduction	t_{CO2}/yr	**821,156**

Complete Financial Summary sheet