CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

Akhfenir Wind Farm Project - Morocco.

Version 01, 14/05/009

A.2. Description of the project activity:

ONA is a Moroccan industrial and financial group. NAREVA Holding (hereafter referred to as "NAREVA") was created in 2005 by ONA Group to manage its activities in the energy and environment sector.

This company plans to build and operate a 200 MW grid-connected wind farm in the municipality of Akhfenir, 100 km east of Tarfaya on the Atlantic coast of Morocco.

The objective of Akhfenir Wind Farm proposed project (hereafter referred to as "the Project") is to use wind resources to generate renewable electricity to supply NAREVA's clients (both private and public owned companies) in the context of the new regulatory framework in Morocco (the new Law 16.08) and "EnergiPro" program.

"EnergiPro" program was initiated in 2007 by ONE (Office National de l'Electricité), the national utility in charge of production, transmission and distribution of electricity. It aims at promoting renewable based auto-production by allowing private operators to produce electrical power for large industrial customers connected to the grid.

Since November 2008, the new Law 16.08 was adopted in Morocco to promote large scale renewable electricity generation projects offering the possibility for industrials to develop and produce electricity from renewable energy within a concession basis with ONE.

Within this legal framework, several private and public owned companies have concluded common memorandum of understandings with NAREVA to allow the latter to supply electricity generated from the Project activity.

The Project activity will achieve greenhouse gas (GHG) emission reductions by avoiding CO_2 emissions from the business-as-usual scenario: electricity generation of power plants connected into the Moroccan grid.

The electricity currently generated by the grid has a calculated operating margin emission factor of [0.771 tCO_2/MWh] and a build margin emission factor of [0.701 tCO_2/MWh] (see section B for further details).

The Project involves the installation of 87 turbines, each of which have a capacity of 2.3 MW, providing a total installed capacity of around 200 MW. Installed in one of the windiest areas of Morocco, with an average wind speed registered[1] at 8.5 to 9 m/s, the Project is expected to generate around 782 GWh per year.

The Project is therefore expected to reduce emissions of greenhouse gases (GHG) by an estimated 590 000 tCO_2e per year during the first crediting period by displacing electricity from the grid. The baseline

[1] Feasibility Study Report

scenario is the same as the scenario existing prior to the start of the implementation of the project activity: electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources.

The Project contributes to sustainable development of the host country as it:

- Achieves GHG emission reductions by avoiding CO_2 emissions and reduces local air pollution from the business-as-usual scenario (electricity generation of power plants connected to the grid).
- Is in line with the Moroccan government's objectives to increase the use of renewable energy and reduce reliance on imported fossil fuels. The diversification of energy sources for electricity production is one of the objectives of the new Moroccan energy strategy with an objective of 20% of renewable energy capacity in the electricity production in 2012 and a targeted development of 1 000 MW wind installed capacity by 2012[2].
- Makes greater use of a renewable resource with significant potential in Morocco: wind energy.
- Strengthens the involvement of Moroccan private sector energy players in the power sector, which is one of the main strategic orientations of the country, as both ONE and the government face difficulties in financing the necessary increase of electric production in the country.
- Increases employment opportunities in the area where the project is located, during the construction phase and for the project operation (approximately 15 up to 20 people will be permanently employed)[3].

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host party)	Private and/or public entity (ies) Project participants (*) (as applicable)	Kindly indicate if the party involved wishes to be considered as project participant (Yes/No)
Morocco (Host country)	NAREVA (Private entity)	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the party (ies) involved is required.		

The contact details of Project participants are provided in Annex 1.

A.4. Technical description of the project activity:

[2] Kingdom of Morocco, Ministry of Energy, Mines, Water & Environment

[3] Feasibility Study Report

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Morocco

A.4.1.2. Region/State/Province etc.:

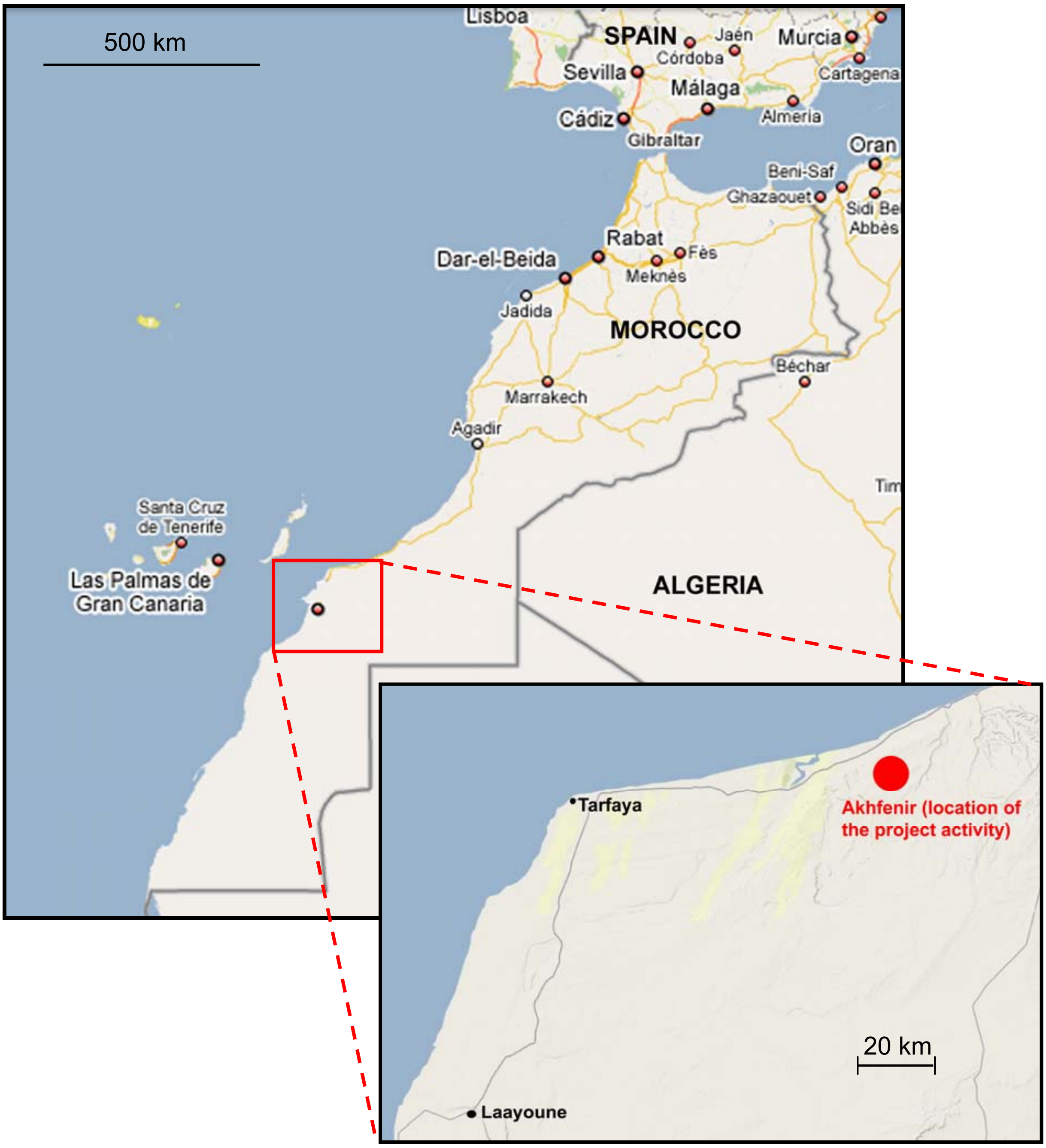
Laâyoune-Boujdour-Sakia El Hamra Region / Laâyoune Province

A.4.1.3. City/Town/Community etc.:

Akhfenir

A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity (maximum one page):

The Project is located at the South of the village of Akhfenir and at 100 km East from Tarfaya. The exact location of the project is defined using geographic coordinates obtained with a Global Positioning System (GPS) receiver: the Project site is located at west longitude of 11° 57' 59" & 12° 01' 1" and north latitude of 27° 55' 45"& 27° 56' 51".



A.4.2. Category(ies) of project activity:

According to Annex A of the Kyoto Protocol, this Project fits in Sectoral Category 1, Energy Industries (renewable/non renewable).

A.4.3. Technology to be employed by the project activity:

Wind energy technology

In wind energy generation, kinetic energy of wind is converted into mechanical energy and subsequently into electrical energy. The kinetic energy passes through the blades of the wind turbines is converted into mechanical energy and rotates the turbine. When the wind blades rotate, the connected generator rotor also rotates, thereby producing electricity. The technology is a clean technology since there are no GHG emissions associated to the electricity generation during operation phase of the project.

Equipment installed

The Project involves an installed capacity of around 200 MW. Each of the wind turbines will have a nominal capacity of 2.3 MW.

Details on the monitoring equipments and their location are given in section B.7.2 of the PDD.

The following tables show the wind power farm indicative characteristics:

Table A.4.3.a – Indicative Main technical parameters of the Project

	Value
Number of wind turbines	87
Nominal power of the wind farm	200.1 MW

Table A.4.3.b – Indicative main technical specifications of the wind turbines

Parameter	Value
Rated capacity	2.3 MW
Number of wind turbines	44
Number of vanes	3
Rotor diameter	93 m
Height of rotor hub	80 m
Hub height wind speed	8.6 m/s
Cut-in speed (m/s)	4 m/s
Cut-out speed (m/s)	25 m/s
Swept area	6 800 m^2

It was included in the purchase agreement that the manufacturer will provide relevant training course for the staff on maintenance and use of equipment when the equipment will have been installed.

Calculation of wind speed

A site-related wind potential analysis and energy yield assessment has been conducted by consultants from DEWI (German Wind Energy Institute), based on measured wind data. The mean long-term wind speed at the hub height of 80 m has been calculated to be included between 8.3 m/s and 8.9 m/s.

Expected annual production

With a wind speed relatively high, averaging 8.6 m/s at a height of 80 m, the wind resources are sufficient to run a wind farm at the location.

The following table gives a summary of the results of the energy yield assessment:

Table A.4.3.c – Indicative calculation results for the wind farm

Calculation	Value
Expected net annual electricity generated	782 GWh
Wind farm load factor	44.6 %

Project phasing

The Project is expected to start operating in July 1st 2011.

The Project will be developed within two investment phases:

- Phase 1 – 44 wind turbines (for a total capacity of 101.2 MW) operational in July 1st 2011
- Phase 2 – 43 wind turbines (for a total capacity of 98.9 MW) operational in July 1st 2012

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

A.4.4.1 – Estimated amount of emission reductions over the chosen crediting period

The Project activity accounts for 3 835 000 tCO_2e of emission reductions over the first crediting period of 7 years. The average of CO_2e emission reductions is 590 000 tons per year.

Table A.4.4.a – Annual estimation reductions over the crediting period

Year	**Annual estimation of emission reductions (in tons of CO_2e)**
2011* (July-December : 6 months)	147 500
2012 **	442 500
2013	590 000
2014	590 000
2015	590 000
2016	590 000
2017	590 000
2018 (January-June : 6 months)	295 000
Total estimated reductions (in tons of CO_2e)	3 835 000
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (in tons of CO_2e)	590 000

** Phase I of the Project wind farm will be operational for the second half of 2011*

*** Phase II of the Project wind farm will be operational for the second half of 2012*

A.4.5. Public funding of the project activity:

The Project will not receive any public funding from Parties included in Annex I of the UNFCCC.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

Approved consolidated baseline and monitoring methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 09, Sectoral Scope: 01/EB 45)[4]

The tool for demonstration and assessment of additionality (Version 05.2/EB 39/Annex 10)

The tool to calculate the emission factor for an electricity system (Version 01.1/EB35/Annex12)

B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

The application of the ACM0002 methodology for the Project is justified because:

- The Project involves an electricity capacity addition to the grid from wind energy sources.
- The geographic and system boundary of the Moroccan power grid can be clearly identified and information on the characteristics of the grid is available.
- The Project does not involve switching from fossil fuels to renewable energy at the site of the project activity.

The monitoring methodology is used in conjunction with the approved baseline methodology ACM0002, and the Project has adopted the baseline methodology ACM0002.

Therefore, the approved methodology ACM0002 is applicable to the Project.

B.3. Description of the sources and gases included in the project boundary:

	Source	Gas	Included?	Justification/Explanation
Baseline	CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the Project activity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project activity	Emissions caused by the Project activity	CO_2	No	As the Project is a wind farm no greenhouse gas emissions from the project have to be considered according to ACM0002.
		CH_4	No	
		N_2O	No	

[4] http://cdm.unfccc.int/methodologies/approved

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

There are four steps to identify alternatives to the project activity:

1. Identification of the alternative scenarios.

2. Analyzing the technical feasibility of the alternative scenarios

3. Excluding options that do not comply with legal and regulatory requirements.

4. Identifying that among the alternatives that do not face any prohibitive barriers, the most economically attractive alternative should be considered as the baseline scenario.

Step 1. Identification of the alternative scenarios.

To provide the same output or services comparable with the proposed CDM Project activity, these alternatives are to include:

Alternative 1 - Provision of equivalent annual power generation by the grid which the proposed project is connected to.

Alternative 2 - The proposed project activity without CDM.

Alternative 3 - Construction of a power plant using other renewable energy with equivalent installed capacity or annual electricity generation.

Alternative 4 - Construction of a fossil fuel-fired power plant with equivalent installed capacity or annual electricity generation.

Step 2. Analyzing the technical feasibility of the alternative scenarios

Besides wind energy, other kinds of energy like solar PV, geothermal, biomass and hydro are the possible grid connected renewable energy technologies that could be applied in Morocco.

Due to the technology development status and the high cost for power generation, solar PV, biomass and geothermal of the similar installed capacity as the Project are alternatives far from being attractive investment in the grid in Morocco.

Only hydropower projects have the investment return rate that can compete over that of wind power projects in Morocco. However, the Project is located in a Saharan climate and water-deficient area[5].

Therefore, **alternative 3** is not feasible. **Alternatives 1, 2 and 4** are all feasible in technology.

Step 3. Excluding options that do not comply with legal and regulatory requirements.
All the alternatives comply with the laws and regulatory requirements for electricity generation in Morocco except for **alternative 4** where some provisions should apply.

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[5] See p.66 of the Environmental Impact Assessment Report, Pöyri, 07/07/2008

Step 4. Identifying that among the alternatives that do not face any prohibitive barriers, the most economically attractive alternative should be considered as the baseline scenario.

Based on the Investment Analysis (See B.5), the Project is not financially attractive without the revenues of CERs. **Alternative 2** is not feasible, thus not the baseline scenario.

In conclusion, the practical and feasible baseline scenario is **alternative 1**, the provision of equivalent amount of annual electricity supply by the grid into which the Project is connected to. Therefore the baseline scenario of the Project is the provision of equivalent amount of annual electricity supply by the Moroccan Power Grid.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

Additionality

The following steps are used to demonstrate the additionality of the Project according to the latest version of the "Tool for the demonstration and assessment of additionality" adopted by the Executive Board (Version 05.2, EB 39) (for the assessments of alternatives please refer to B.4):

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a. Define alternatives to the project activity

To provide the same output or services comparable with the proposed CDM project activity, these alternatives are to include:

Alternative 1 - Provision of equivalent annual power generation by the grid which the proposed project is connected to.

Alternative 2 - The proposed project activity without CDM.

Alternative 3 - Construction of a power plant using other renewable energy with equivalent installed capacity or annual electricity generation.

Alternative 4 - Construction of a fossil fuel-fired power plant with equivalent installed capacity or annual electricity generation.

As mentioned in B.4 step 4, **alternative 1** is the only practical and feasible scenario.

Sub-step 1b. Consistency with mandatory laws and regulations:

All alternatives comply with the laws and regulatory requirements for electricity generation in Morocco except for **alternative 4** where some provisions should apply.

Step 2: Investment analysis

Sub-step 2a: Determine appropriate analysis method

The "Tool for the demonstration and assessment of additionality" suggests three analysis methods. These are Simple cost analysis (Option I), Investment comparison analysis (Option II) and Benchmark analysis (Option III).

Given that the Project will earn revenues not only from the CERs sales but also from electricity sales, the Simple cost analysis (Option I) is not appropriate. The Investment comparison analysis (Option II) is only applicable to projects whose alternatives are similar investment projects. As the alternative to the Project is generation of power from the Moroccan grid as opposed to individual investment alternatives, (Option II) is not appropriate.

Therefore, the Project will use Benchmark analysis method (Option III).

Sub-step 2b. Option III: Benchmark Analysis

The Project's IRR (Internal Rate of Return) is selected as a financial indicator.

The IRR of the Project must be superior to 16% in order for the Project to be financially attractive to the investors[6]. This rate is then considered as the benchmark IRR for the Project.

Sub-step 2c. Calculation and comparison of financial indicators

1) Basic parameters for calculation of financial indicators

The basic assumptions used for calculation of the Project's IRR are shown in the following table:

Table B.5.a - Assumptions used for the cash flow calculation

Parameters	Unit	Value	Data source
Total Capex	MDh	3 188	Feasibility Study Report
Annual O&M cost (average on the Project's period assessment)	MDh	78	Feasibility Study Report
Project lifetime	Years	20 to be extended	ONE Agreement
Crediting period	Years	21	Feasibility Study Report

2) Comparison of IRR for the proposed project and the financial benchmark

Table B.5.b – Benchmark analysis on IRR

Alternative	IRR
Without CDM Revenue	7.9%
Benchmark rate	16%

In accordance with Benchmark analysis (Option III), if the financial indicator considered (IRR) of the Project is lower than the benchmark, the Project is not considered as financially attractive.

Based on the data above, the IRR of the total investment of the Project not undertaken as a CDM project is 7.9%, which is lower than the benchmark rate of 16%. Thus the Project without carbon revenues is not financially attractive.

[6] Source : Directives of ONA Holding (mother company of NAREVA)

Sub-step 2d. Sensitivity analysis

The objective of sensitivity analysis is to show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. The investment analysis provides a valid argument in favor of additionality only if it consistently supports (for a realistic range of assumptions) the conclusion that the project activity is unlikely to be the most financially attractive or is unlikely to be financially attractive.

For the proposed project, four financial parameters were taken as uncertain factors for sensitive analysis of financial attractiveness:

1) Total investments

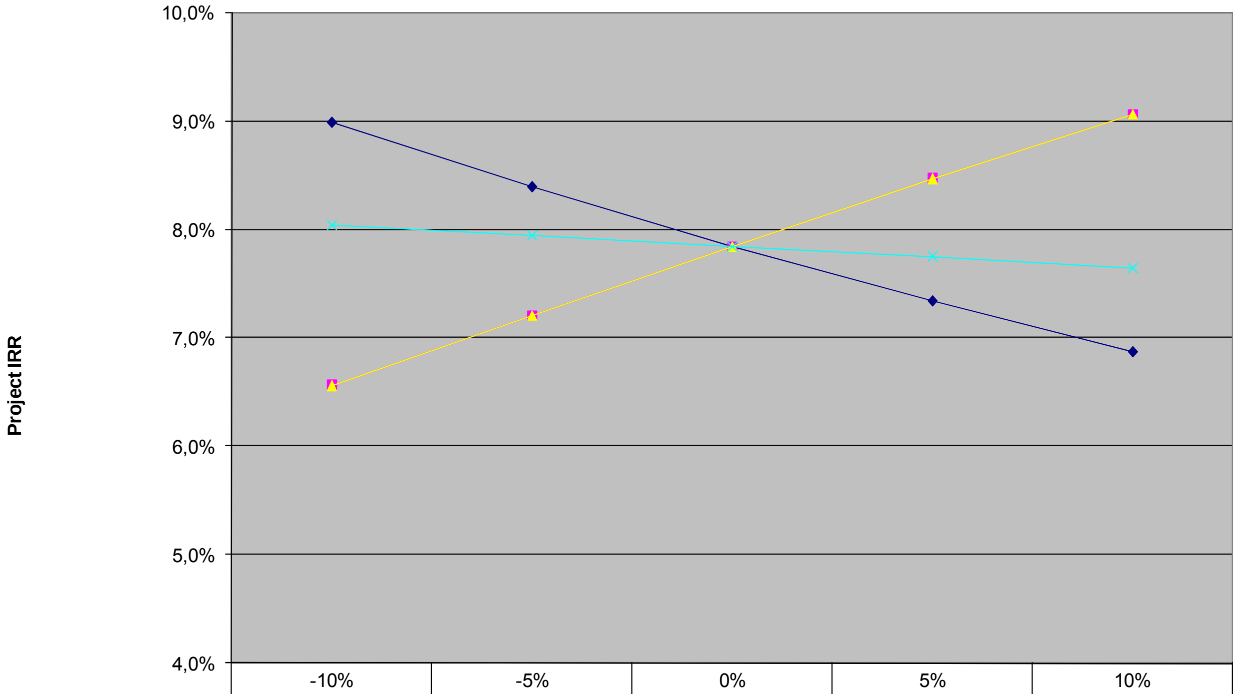
2) Annual output (supplied power)

3) Selling Tariff

4) Annual O&M cost

The impacts of total investments, annual output, selling tariff and the annual O&M are selected to check out the impact of their reasonable variations on the project's IRR. Assuming these four parameters to change within the range between (-10% +10%), then the outcomes of IRR sensitivities will be presented.

The results of sensitive analysis are shown in Figure 1 below.



	-10%	-5%	0%	5%	10%
Project Capex	9,0%	8,4%	7,8%	7,3%	6,9%
Annual Output	6,6%	7,2%	7,8%	8,5%	9,1%
Selling Tariff	6,6%	7,2%	7,8%	8,5%	9,1%
Annual O&M cost	8,0%	7,9%	7,8%	7,7%	7,6%

Figure 1 – Sensitivity analysis results

As shown previously, when the parameters selected varies from -10% to +10%, the project IRR is still much lower than the benchmark rate of 16%.

Consequently, under reasonable variations in the critical assumptions, the conclusion regarding the project CDM additionality is robust and supported by the sensitivity analysis.

Step 3. Barrier Analysis

The "Tool for the demonstration and assessment of additionality" (Version 05.2) states that project participants may choose to apply Step 2 (Investment analysis) or Step 3 (Barrier Analysis).

Step 4. Common Practice Analysis

Sub-step 4a. Analyze other activities similar to the proposed project activity:

The wind farm projects developed and under development in Morocco are as follows:

Table B.5.c – Wind farm projects in Morocco

Project	Capacity	Project status	CDM status
Koudia El Beida (IPP)	50 MW	On production since 2000	Not developed as a CDM project
Essaouira ONE	60 MW	On production since 2007	Registered
Tétouan Lafarge	32 MW	- Phase 1 (10MW) on production - Phase 2 (22 MW) under development	- Phase 1: registered – CERs issued - Phase 2: under development
Haouma- Tangier NAREVA Holding	60 MW	Under development	Under development
Laayoune CIMAR	10 MW	Under development	Under development
Tanger ONE	140 MW	On construction	Under development
Tarfaya (IPP)	300 MW	In the bidding process	reference to CDM revenues has been included in the tender document

Sub-step 4a. Discuss any similar options that are occurring

Morocco signed the Kyoto Protocol in 2002. The Koudia El Beida project was not eligible to CDM at the time of its implementation.

All the other wind projects in Morocco are either registered or under CDM development.

In conclusion, the Project is additional. .

Concerning the early consideration on the CDM requirement, the Project owner considered applying for CDM project before the construction of the Project. Indeed, the business model of NAREVA is based on the CDM revenues and electricity supply agreement signed by NAREVA and its clients for this Project specifically refer to the right of NAREVA to develop, manage and earn the Carbon credit resulting from the Project activities.
In addition, first technical studies were launched in 2007. Also, the Project Idea Note is dated as submitted on January 2009.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Since the project activity is the installation of a new grid-connected renewable power plant/unit, we can consider as baseline scenario that electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculation described in the "Tool to calculate the emission factor for an electricity system" (Version 01.1).

The combined margin (CM) emission factor consists of a weighted average between an Operating Margin (OM) emission factor and the Build Margin (BM) emission factor.

This PDD is using the most recent data available, provided by ONE, the Moroccan National Electricity Office (please refer to Annex 3 for the baseline data).

Step 1. Identify the relevant electric power system

A project electricity system is defined by the special extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints. In Morocco, this system is the national electric grid operated by the ONE.

Step 2. Select an operating margin (OM) method

The "Tool to calculate the emission factor for an electricity system" offers four methods to calculate the OM emission factor ($EF_{grid,OM,y}$):

- (a) Simple OM
- (b) Simple adjusted OM
- (c) Dispatch data analysis OM
- (d) Average OM

Of these procedures, option a (Simple OM) is applied for the project because undertaking a dispatch data analysis (the preferred methodological option) cannot be done at a reasonable cost by ONE. Indeed, data are not readily available from the relevant authorities, and the analysis is a very time-consuming task. The simple OM can be used in the case of the proposed project activity since low-cost/must-run sources constitute less than 50% of the total grid: only 6 to 8% of Moroccan power generation was based on must run renewable energy sources (see Annex 3).

The Simple OM emission factor can be calculated using either one of the following data vintages:

- Ex ante option : a 3-year generation-weighted average, based on the most recent data available at the time of submission and not updated during monitoring period
- Ex post option : requiring the emission factor to be updated annually during monitoring period

The choice of ex ante option is specified in this PDD.

Step 3. Calculate OM emission factor according to the selected method

The OM is calculated as the generation-weighted emissions per electricity unit of all generating units serving the system, excluding low-operating cost and must-run power plants. Low-operating cost and must run power plants include typically hydro, low cost biomass and geothermal. The simple OM emission factor has been calculated based on a 3-year vintage (2006-2008):

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}}$$

Where:

- $F_{i,j,y}$ is the amount of fuel (mass or volume) i consumed by relevant power sources i in year(s) y, j refers to the power sources delivering electricity to the grid not including low-operating cost and must run plants, including imports to the grid,
- $COEF_{i,j}$ is the CO_2 emission coefficient of fuel (tCO_2/mass or volume) taking into account the carbon content of the fuels used by the relevant power sources j and the percent oxidation of the fuel in year(s) y,
- $GEN_{i,j}$ is the electricity (MWh) delivered to the grid by source j.

In terms of the Moroccan electricity sector the 3-year vintage OM was calculated using the data of all operational power fossil fuel fired plants providing electricity to the grid for the years 2006, 2007 and 2008. The data of the plants used in the Operating Margin are provided in the tables presented in Annex 3.

Imports have been taken also into account. These imports have been taken into account using an emission factor of 0 t CO_2/MWh[7].

$EF_{OM, simple, y}$ = 0,7717 tCO_2/MWh

Step 4. Identify the cohort of power plants to be included in the build margin

According to the “Tool to calculate the emission factor for an electricity system”, the sample group of power units m used to calculate the build margin consists of either:

- (a) the set of five power units that have been built most recently, or
- (b) the set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

The option related to the set of power units that comprises the larger annual generation should be used.

[7] According to the tool to calculate the emission factor for an electricity system (p4) : « For imports from connected electricity systems located in another host country(ies), the emission factor is 0 tons CO_2 per MWh ».

During 2008, the most recent year for which the data is available, the total electricity generation of the six most recent power plants that account of more than 20% of the total electricity generation, has been established at 8 416 GWh, This represents 35% of the overall electricity generated by all power plants in 2008. An overview of the data on the electricity generation and fuel consumptions of the power plants is presented in Annex 3.
Then, option (b) has been used for the computation of the BM emission factor.

Step 5. Calculate the build margin emission factor

The Build Margin emission factor (BM_yEF) is calculated as the generation-weighed average emission factor (tCO2/MWh) of a sample power plants m, using formula:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m,y}}{\sum_{m} GEN_{m,y}}$$

Where:

- $F_{i,m,y}$ the amount of fuel i (in a mass or volume unit) consumed by power plant sample m in year(s) y, m refers to the power plant sample delivering electricity to the grid, not including low operating cost/must run power plants, including imports to the grid;
- $COEF_{i,j}$ is the CO2 emission coefficient of fuel i (tCO2 per mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power plant sample m and the percent oxidation of the fuel in year(s) y, and
- $GEN_{i,j}$ is the electricity output (MWh) delivered to the grid by the sources m.

The data of the plants used in the Building Margin are provided in the tables presented in Annex 3.

$EF_{grid, BM, y}$ = 0,7018 tCO2/MWh

In terms of vintage of data, the Project participant has chosen Option (1) of the “Tool to calculate the emission factor of an electricity system” consisting of the following: *for the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.*

Step 6. Calculate the combined margin emission factor

The combined margin (CM) emissions factor (EFgrid,CM,y) is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

Where:

- $EF_{grid,BM,y}$ = Build margin CO2 emission factor in year y (tCO_2/MWh)
- $EF_{grid,OM,y}$ = Operating margin CO2 emission factor in year y (tCO_2/MWh)
- w_{OM} = Weighting of operating margin emissions factor (%)
- w_{BM} = Weighting of build margin emissions factor (%)

According to the methodological tool, the following default values should be used for wind and solar power generation project activities for the first crediting period and for subsequent crediting periods: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature).

$EF_{grid, CM, y}$ = 0,7542 tCO_2/MWh

Step 7 – Calculation of the emission reductions

Project emissions

According to the baseline methodology ACM0002, the GHG emission of a wind farm project can be neglected. For the Project, it is expected that electricity from the grid will be used in the site for lighting and control equipment. Although, the expected electricity import from the grid is negligible, it will be monitored and taken into account in the emission reductions evaluation

Leakage emissions

According to the consolidated baseline methodology ACM0002, the main indirect emissions potentially giving rise to leakage in the context of electric sector projects result from activities such as power plant construction, fuel handling (mining, processing, and transportation), and land inundation (for hydroelectric projects). The project developer does not need to consider such indirect emissions when applying the methodology. Therefore the Project can take no account of such leakages, LEy= 0 tCO_2e.

Emission reductions

The Project activity will generate GHG emission reductions by avoiding CO_2 emissions from electricity generation by fossil fuel power plants. The emission reduction (ERy) during a given year y is calculated as follows:

ERy = BEy − PEy − LEy

Where

- ERy = Emission reductions in year y (t CO_2e/yr)
- BEy = Baseline emissions in year y (t CO_2e/yr)
- PEy = Project emissions in year y (t CO_2/yr)
- LEy = Leakage emissions in year y (t CO_2/yr)

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	**$NCV_{i,y}$**
Data unit:	GJ/T
Description:	Net calorific value (energy content) per mass unit of fuel *i* in year *y*
Source of data used:	- Official Statistical book "Annuaire des Statistiques" – 2007 - IPCC default values as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the Tool to Calculate the Emission Factor for an Electricity System (version 1.1), the national specific value shall be used preferentially
Any comment:	-

Data / Parameter:	**$EF_{CO2i,y}$**
Data unit:	tCO2/TJ
Description:	CO2 emission factor of fossil fuel *i* in year *y*
Source of data used:	IPCC default values as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	No other data is publicly available. IPCC guidelines have been used in a conservative manner.
Any comment:	-

Data / Parameter:	**$FC_{i,m,y}$**
Data unit:	Tonnes (Nm^3 for Natural Gas)
Description:	Amount of fossil fuel *i* consumed by each power plant/unit *m* in year *y*.
Source of data used:	ONE – Office National de l'Electricité (Moroccan Electricity Office)
Value applied:	Data for the 2006-2008 period is available in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is obtained from official sources
Any comment:	-

Data / Parameter:	**$EG_{m,y}$**
Data unit:	MWh
Description:	Net electricity generated and delivered to the grid by power plant/unit *m* in year *y*.
Source of data used:	ONE – Office National de l'Electricité (Moroccan Electricity Office)
Value applied:	Data for the 2006-2008 period is available in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is obtained from official sources
Any comment:	-

Data / Parameter:	***Plant name***
Data unit:	Text
Description:	Identification of power sources for the OM (all the plants in the grid).
Source of data used:	ONE – Office National de l'Electricité (Moroccan Electricity Office)
Value applied:	Data for the 2006-2008 period is available in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is obtained from official sources
Any comment:	-

Data / Parameter:	***Plant name***
Data unit:	Text
Description:	Identification of power sources for the BM (recent additions to the grid).
Source of data used:	ONE – Office National de l'Electricité (Moroccan Electricity Office)
Value applied:	See table in Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is obtained from official sources
Any comment:	-

B.6.3. Ex-ante calculation of emission reductions:

The ex-ante emission reductions (ERy) are calculated as follows:

$$ER_y = BE_y - PE_y - L_y$$

Where:

- ER_y = Emission reductions in year y (tCO2)
- BE_y = Baseline emissions in year y (tCO2)
- PE_y = Project Emissions in year y (tCO2)
- L_y = Leakage emissions in year y (tCO2)

Baseline emissions

The equation for calculating emissions in the baseline (BEy) is:

$$BE_y = EG_y * EF_y$$

Where:

- BE_y: Baseline emissions (t CO2e)
- EG_y : Annual electricity supplied by the project to the grid (MWh)
- EF_y : baseline emission factor (tCO2e / MWh)
- y : refers to a given year

Project emissions

According to the baseline methodology ACM0002, the GHG emission of the proposed project within the project boundary is zero, i.e.

$$PE_y = 0$$

Leakage

According to the baseline methodology ACM0002, the leakage of the proposed project is not considered,

$$L_y = 0$$

Therefore,

$$ER_y = EG_y * EF_y = 782\ 000\ MWh * 0{,}7542\ tCO_2/MWh = 590\ 000\ tCO_2e$$

B.6.3a - Key Information and Data Used to Determine the Baseline Scenario

Electricity Generated Emissions Reductions	Per year	Units
Operating Margin Emissions Factor in 2006	0,825	tCO_2/MWh
Operating Margin Emissions Factor in 2007	0,765	tCO_2/MWh
Operating Margin Emissions Factor in 2008	0,724	tCO_2/MWh
Operating Margin Emissions Factor average 2006 / 2008	0,771	tCO_2/MWh
Build Margin Emissions Factor	0,701	tCO_2/MWh
Baseline Emissions Factor (EF_y)	0,754	tCO_2/MWh

Electricity Generated Emissions Reductions	Per year	Units
Electricity generated by Project (EG)	782 000	MWh/year
Baseline Emissions (BE)	590 000	tCO_2/MWh
Project Emissions (PE)	0	tCO_2/MWh
Emissions reduction from electricity generation	590 000	$tCO_2/year$

B.6.4 Summary of the ex-ante estimation of emission reductions:

Year	Estimation of project activity emissions (tones of CO_2 e)	Estimation of baseline emissions (tons of CO_2 e)	Estimation of leakage (tones of CO_2 e)	Estimation of Overall emission reductions (tons of CO_2e)
2011 (July-December)	0	147 500	0	147 500
2012	0	442 500	0	442 500
2013	0	590 000	0	590 000
2014	0	590 000	0	590 000
2015	0	590 000	0	590 000
2016	0	590 000	0	590 000
2017	0	590 000	0	590 000
2018 (January-June)	0	295 000	0	295 000
Total (tons of CO_2e)	**0**	**3 835 000**	**0**	**3 835 000**

B.7. Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	**EG_y**
Data unit:	MWh
Description:	Electricity supplied to the grid by the Project activity
Source of data to be used:	Electricity meter reading at Project boundary
Value of data applied for the purpose of calculating expected emission reductions in section B.5	782 000 MWh
Description of measurement methods and procedures to be applied:	Data will be measured on site on a ten minutes basis and monthly recorded
QA/QC procedures to be applied:	Electricity supplied by the Project activity to the grid. Double check by accounting receipts established by ONE
Any comment:	

Data / Parameter:	**EP_y**
Data unit:	MWh
Description:	Electricity supplied by the grid consumed in the site
Source of data to be used:	Electricity meter reading at Project boundary
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0 MWh
Description of measurement methods and procedures to be applied:	Ten minutes measurements and monthly recording
QA/QC procedures to be applied:	Electricity imported from the grid. Double check by accounting receipts established by ONE
Any comment:	

B.7.2. Description of the monitoring plan:

a) The aim of the monitoring plan

Monitoring is a key procedure to verify the real and measurable emission reductions from the Project. To guarantee the Project's real, measurable and long-term GHG emission reductions, the monitoring plan is established.

b) The data which needs to be monitored

Two main parameters will be subject to an ex-post monitoring:

- The electricity supplied to the power grid
- The electricity imported from the grid for the site local electricity needs.

The baseline emission factor: fixed on ex-ante calculation and doesn't need to be monitored every year as per the latest version of the "Tool to calculate the emission factor for an electricity system" (Version 1.1).

c) Application of the monitoring plan

According to the baseline study, the key parameter of the emissions' reductions evaluation is the net electricity supplied to grid by the wind farm. The recommended monitoring methodology is based on a specific and continuous measure of both the electricity supplied to grid and the electricity imported from the grid. The net electricity supplied to the grid, which constituted the key parameter of the ER evaluations, will be derived from the difference of these two key monitored parameters.

Highly accurate electricity meters will be used to monitor simultaneously both the electricity supplied to the grid and the electricity imported from the grid.

The electricity meters will be installed and sealed by the Office National d'Electricité ONE, which is the public utility that has the monopoly of the national electricity grid development and management. It will serve as the basis of the electricity supply and electricity imports billing. The two ONE electricity meters will be regularly checked and calibrated by ONE according to its official maintenance and calibration procedures.

The two meters readings of both the supplied and imported electricity will be recorded at the same time every 24h. The meters reading data will be processed and stored electronically in a computer system with regular backup copy on a digital basis complemented by printed versions of the monthly electricity

The monitoring procedure will be defined in a monitoring manual that include, in particular: (i) staff organisation with job descriptions, (ii) instructions for data transfer and record handling protocols, and (iii) calibration checking procedures for the measuring equipment. An internal audit procedure will ensure the quality control and will check the reliability and security of the monitoring. Following these audits, corrective actions will be decided, if necessary. All the data will be archived until two years after the end of the crediting period.

B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies):

This baseline and monitoring methodology application study was completed on 15/05/2009 by M.Alexis Gazzo at Ernst & Young.

The above entity is not considered as a project participant.

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

July 1st, 2011 (Project operation date)

C.1.2. Expected operational lifetime of the project activity:

20 years to be extended[8]

C.2. Choice of the crediting period and related information:

C.2.1. Renewable crediting period:

C.2.1.1. Starting date of the first crediting period:

The crediting period will start on 01/07/2011, or on the date of registration of the CDM project activity, whichever is later.

C.2.1.2. Length of the first crediting period:

7 years.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

SECTION D. Environmental impacts

>>

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

>>

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

Despite the fact that the wind farm projects are not subject to an environmental impact assessment according to the Morocco EIA law N°12-03, NAREVA has carried an EIA for the Project.

[8] Feasibility Study Report

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

STAKEHOLDER'S CONSULTATION TO BE PERFORMED DURING THE SECOND SEMESTER OF 2009

E.2. Summary of the comments received:

STAKEHOLDER'S CONSULTATION TO BE PERFORMED DURING THE SECOND SEMESTER OF 2009

E.3. Report on how due account was taken of any comments received:

STAKEHOLDER'S CONSULTATION TO BE PERFORMED DURING THE SECOND SEMESTER OF 2009

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Represented by:	Reda Znaidi
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Salutation:	M.
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

This project will not receive any public funding.

Annex 3

BASELINE INFORMATION

Table A1: Calculation of OM factor for 2006

Title / Power plant			Consumption						Electricity generation (MWh)	Emissions	
			Imported Coal (t)	Local Coal (t)	Pet Coke (t)	Heavy oil (t)	Gasoil (t)	Natural gas t	MWh	Total (ton CO2/yr	Specific CO2 emission (tonCO2/MWh)
Coal Type Power plant	JLEC		3 888 948,00						10 472 653,00	10 161 613,45	0,9703
	Mohammedia	#1	677 417,00						1 559 967,00	1 770 054,45	1,1347
	Jerada		330 269,00		122 648,00	1 772,00			869 093,00	1 257 126,36	1,4465
Fuel oil Type Power plant	Mohammedia	#2				338 187,00			1 317 080,00	1 051 633,87	0,7985
	Kénitra					240 649,00			808 485,00	748 327,52	0,9256
	Mohammedia	TG (33MW)				33 393,00	3 094,00		96 098,00	113 698,03	1,1831
	Tan Tan	TG (33MW)				37 802,00	1 122,00		102 280,00	121 124,97	1,1842
	Tit Mellil	TG (33MW)				65 577,00	2 527,00		187 900,00	211 971,49	1,1281
	Tétouan	TG (33MW)				18 836,00	1 830,00		57 414,00	64 403,78	1,1217
	Agadir	TG (20 MW)				330,00	37,00		808,00	1 144,07	1,4159
	Tanger	TG (20 MW)				315,00	11,00		598,00	1 014,58	1,6966
	Tétouan	TG (20 MW)									
	Laayoune	TG				5 100,00			24 144,00	15 859,07	0,6569
	Laayoune	TG II									
	Dakhla	TG				9 372,00			41 943,00	29 143,38	0,6948
Gasoil type	Total Micro Diesel plants						980,00		2 970	3 122,57	1,0514
Natural gas	Tahaddarat							334 182	2 512 333,00	899 885,29	0,3582
Total Renewable	**Total**		**4 896 634**			**751 333**	**9 601**	**334 182**	**18 053 766**	**0,00**	**0,0000**
			5 019 282								
Total									**19 938 866**	**16 450 123**	**0,8250**

Table A2: Calculation of OM factor for 2007

Title / Power plant			Consumption: Imported Coal (t)	Consumption: Local Coal (t)	Consumption: Pet Coke (t)	Consumption: Heavy oil (t)	Consumption: Gasoil (t)	Natural gas t	Electricity generation (MWh): MWh	Emissions: Total (ton CO2/yr	Emissions: Specific CO2 emission (tonCO2/MWh)
Coal Type Power plant	JLEC		3 794 685,87						10 016 392,00	9 915 311,54	0,9899
	Mohammedia	#1	664 045,00						1 547 659,00	1 735 114,12	1,1211
	Jerada		325 466,00	57 413,00	90 461,00	1 772,00			892 449,00	1 274 849,53	1,4285
Fuel oil Type Power plant	Mohammedia	#2				368 484,00			1 448 578,00	1 145 846,10	0,7910
	Kénitra					251 489,00			869 166,00	782 035,83	0,8998
	Mohammedia	TG (33MW)				20 864,00	325,00		58 820,00	65 914,71	1,1206
	Tan Tan	TG (33MW)				5 808,00	846,00		17 792,00	20 756,30	1,1666
	Tit Mellil	TG (33MW)				53 304,00	1 029,00		149 993,00	169 034,02	1,1269
	Tétouan	TG (33MW)				17 104,00	283,00		48 314,00	54 088,70	1,1195
	Agadir	TG (20 MW)				2 643,00	83,00		6 350,00	8 483,19	1,3359
	Tanger	TG (20 MW)				1 297,00	38,00		3 231,00	4 154,26	1,2858
	Tétouan	TG (20 MW)									
	Laayoune	TG				3 299,00			15 027,00	10 258,64	0,6827
	Laayoune	TG II					32 822,00		97 159,00	104 580,74	1,0764
	Dakhla	TG				9 013,00			43 899,00	28 027,03	0,6384
Gasoil type	Total Micro Diesel plants						1 732,00		3 296	5 518,67	1,6744
Natural gas	Tahaddarat							402 610	2 822 944,00	1 084 148,21	0,3840
Total Renewable	Total		**4 784 197**			**735 077**	**37 158**	**402 610**	**18 041 069**	0,00	0,0000
			4 932 071								
Total									**21 427 269**	**16 408 122**	**0,7658**

Table A3: Calculation of OM factor for 2008

Title / Power plant			Consumption: Imported Coal (t)	Consumption: Local Coal (t)	Consumption: Pet Coke (t)	Consumption: Heavy oil (t)	Consumption: Gasoil (t)	Natural gas t	Electricity generation (MWh): MWh	Emissions: Total (ton CO2/yr	Emissions: Specific CO2 emission (tonCO2/MWh)
Coal Type Power plant	JLEC		3 658 978,90						10 022 801,00	9 560 716,48	0,9539
	Mohammedia	#1	351 227,00						823 853,00	917 737,40	1,1140
	Jerada		393 870,00		72 165,00	2 097,00			815 132,00	1264354,999	1,5511
Fuel oil Type Power plant	Mohammedia	#2				423 863,00			1 684 874,00	1 318 053,88	0,7823
	Kénitra					467 962,00			1 637 969,00	1 455 185,12	0,8884
	Mohammedia	TG (33MW)				31 914,00	643,00		85 927,00	101 289,28	1,1788
	Tan Tan	TG (33MW)								0,00	#DIV/0!
	Tit Mellil	TG (33MW)				99 496,00	1 217,00		276 833,00	313 272,72	1,1316
	Tétouan	TG (33MW)				33 844,00	504,00		94 081,00	106 847,96	1,1357
	Agadir	TG (20 MW)				7 857,00	122,00		18 497,00	24 821,03	1,3419
	Tanger	TG (20 MW)				2 133,00	85,00		5 292,00	6 903,66	1,3045
	Tétouan	TG (20 MW)				4 861	217,00		11 855,00	15 807,30	1,3334
	Laayoune	TG				1 778,00	214		8 311,00	6 210,78	0,7473
	Laayoune	TG II				18 340	68 906,00		246 841,00	276 585,66	1,1205
	Dakhla	TG				8 221,00			45 523,00	25 564,21	0,5616
Gasoil type	Total Micro Diesel plants						2 852,00		3 460	9 087,33	2,6264
Natural gas	Tahaddarat							**408 954**	2 867 423,00	1 101 230,31	0,3840
Total Renewable	Total		**4 404 076**			**1 102 366**	**74 760**	**408 954**	**18 648 672**	0,00	0,0000
			4 476 241								
Total									**22 789 810**	**16 503 668**	**0,7242**

Table A4: Fuel data base

Fuel Type	Net Calorific Value		Emission factor	
	kcal/kg	GJ/T	t CO_2/TJ	t CO_2/T
Natural Gas		48,000	56,10	2,693
Imported coal	6 600	27,621	94,6	2,613
Local coal	5 600	23,436	98,3	2,304
Pet coke		32,5	97,5	3,169
Heavy fuel oil	9 600	40,176	77,4	3,110
Gasoil		43	74,1	3,186
References	Annuaire des statistiques 2007	2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 1, Table 1.2 Volume 2 ; Table 2.2		

Table A5: Calculation of OM factor (2006-2008)

Electricity generation by OM plants		CO2 emissions by OM plants		
2006	19 938 866	2006	16 450 123	0,8250
2007	21 427 269	2007	16 408 122	0,7658
2008	22 789 810	2008	16 503 668	0,7242
Total	**64 155 945**	**Total**	**49 361 913**	**0,7717**

Tble A6: Calculation of 2008 BM factor of the National grid

	Plant name		Technology	year operation	Fuel	MWh in 2008	% total Production	Accumalted %	% of total selected	CEF	Result
1	Tahaddart		Combined Cycle	2005	Nautral Gas	2 867 423	12%	12%	34,07%	0,384049	0,13084
2	STEP Afourer		Small hydro STEP	2004	Hydro	443 657	2%	14%	5,27%	0,000000	0,00000
3	El Hansali		Small hydro Hansali	2003	Hydro	38 063	0%	14%	0,45%	0,000000	0,00000
4	Ait Messoud		Small hydro Ait Messoud	2003	Hydro	10 626	0%	14%	0,13%	0,000000	0,00000
5	Eddakhla		TAG Ad Dakhla	2002	Fuel	45 523	0%	14%	0,54%	0,561567	0,00304
6	JLEC (3 and 4)		Steam power: Jorf Units 3&	2000	Coal	5 011 401	21%	35,2%	59,54%	0,953897	0,56796
	Total					**8 416 693**			**100%**	**BM Factor**	**0,7018**

Total electricity supplied to the grid in 2007				23 858 591		
The power plant capacity additions in the electricity system that comprise 20% of the system generation and that have been built most recently	8 416 693			35,28%	Selected	
The five power plants that have been built most recently	3 405 292			14,27%		

The Essaouira wind project is not included since it has been registred as CDM project

Annex 4

MONITORING INFORMATION

See sections above