AFRICAN DEVELOPMENT BANK

ONE WIND ENERGY PLAN MOROCCO

CTF Appraisal Document

Table Of Contents

Abbreviations

ADEREE	Agence Nationale pour le Développement des Énergies Renouvelables et de l'Efficacité Énergétique
AfDB	African Development Bank
CCGT	combined cycle gas turbine
CDER	Centre de Développement des Énergies Renouvelables
COMAFTEP	Comité Marocain pour le Financement des Technologies et Énergies Propres
CO_2	carbon dioxide
CTF	Clean Technology Fund
FDE	Fonds de Développement de l'Énergie
IBRD	International Bank for Reconstruction and Development
IFC	International Finance Corporation
IP	Investment Plan
MAD	Moroccan dirham
MASEN	Moroccan Agency for Solar Energy
Morocco CTF IP	Clean Technology Fund Investment Plan for Morocco
ONE	Office National de l'Électricité
STEP	Station de Turbinage et de Pompage
UA	Units of Account
WEP	Wind Energy Program
WBG	World Bank Group

Weights and measures

GW	gigawatt
KWh	kilowatt-hour
m2	square meter
Mm3	thousand cubic megameter
MW	megawatt
TWh	terawatt-hour

Currencies

€	Euros
$	United States dollars

List of figures

RESULTS-BASED LOGICAL FRAMEWORK

Country and program name: ONE Wind Plan—Morocco
Purpose of the program: To develop infrastructure and business models to scale up wind power and rural electrification

	Results chain	Performance indicators Indicator (including CSI)	Baseline	Target	Means of verification	Risks/mitigation measures
Impact	- Increase of Morocco's wind energy generation capacity - Increase of access to electricity in rural areas	Percentage of electricity generated by wind energy resources Average access rate in the program area	1% (in 2007) 93% (in 2007)	14% (in 2020) 100% (in 2020)	National utility	There is a risk that the Moroccan authorities may not continue to engage in the country's renewable energy agenda, but long-standing government commitments indicate that this risk is low and that commitment is stable.
Outcomes	Less energy imports	Reduced imports of fuel for electricity	97% (in 2010)	95% (in 2020)	Ministry of Energy reports	
	Reduction of CO_2 emission	Reduction of CO_2 emissions per year	345 701 TCO2/year (in 2010)	3,25 MT CO2 / year (in 2020)	ONE	
	Progress implementing competitive bidding for WIND	Progress achieved toward government renewable energy commitments	N/A	Government follows through on commitments by 2019	AfDB Program Completion Report	The capacity of developers and ONE's capacity to engage in a PPP could be limited, so capacity building will be necessary. Financially or technically weak private partners could be selected, or bids could be lacking.
Outputs	Installation of satisfactory wind generation capacity	Wind generation capacity installed	283.5 MW in 2011	+550 MW in 2017	AfDB Program Completion Report	The use of hybrid hydro systems to displace gas turbines as baseloads in wind farms is not yet an established technology. ONE will use contract specifications to ensure that the developer uses a wind technology that has been certified by a global certification institution.
	Installation of supplementary hybrid hydro storage and generation capacity	Hybrid-hydro storage and generation capacity installed	464 MW in 2011	520 MW in 2015	AfDB Program Completion Report	
	New connections in the electric system	Number of households connected	1 766 960 (2007)	2 300 000 in 2020 (+533 040 additional households)	AfDB Project Completion Report	

Key activities	Components	Inputs
	Wind/hydro Component	
	Installation of 550 MW integrated, multi-site wind capacity	2,166.43 million US dollars
	Installation of 520 MW hybrid hydro capacity	

AfDB=African Development Bank; CO_2=carbon dioxide; CSI=Core Sector Indicator; CTF=Clean Technology Fund; km=kilometers; kt=kilotons; MW=megawatts; N/A=not applicable; PPP=public-private partnership; USD=United States dollars

1. STRATEGIC CONTEXT

Global and Regional Context

Wind energy is among the most financially viable renewable energy sources currently. Wind power generation and supply cost more than electricity generated and supplied using traditional fossil-fuel generation. However, the cost of wind power generation has dropped dramatically - by almost 90 percent - over the past 20 years. Today, wind power could become competitive with fossil-fuel generation if stable, supportive regulatory policies are in place. There are key impediments in Africa that lead to a higher incremental cost of wind energy. Transformational projects such as the ONE Wind Project can lower this cost. From an economic point of view, wind-farms have many benefits. They provide emissions-free electricity, create jobs and consequently revenues from tax payments. Additionally wind projects can generate carbon credits for additional revenue. Local manufacturing of wind components has the potential to make the wind energy more cost effective.

Africa is lagging behind the rest of the world in the development of wind power with installed wind energy capacity only around 0.5 percent of global wind energy capacity. Africa's capacity is concentrated in three countries – Egypt, Morocco and Tunisia – with over 97 percent of the continent's wind generation capacity. And even in these countries, adoption of wind powered electricity generation has progressed rather slowly. Wind generated electric power contributes less than 1 percent of electricity generation on the continent, behind the OECD penetration rate of 3.8 percent and ahead of non-OECD emerging markets with a penetration rate of 0.2 percent.

Trends at the global market level paint a somewhat different picture. Although wind energy generation capacity is starting from a low base, accounting for 0.5 percent of total global power generation capacity in 2000, wind energy is now the world's fastest-growing energy source in terms of both installed capacity and technological innovations. According to the IEA, wind based power has grown at an average annual rate of nearly 32 percent over the past ten years.

Key impediments that prevented wind energy to penetrate Northern Africa can be found in the infrastructure, on a technical level as well as in the general business climate. Those impediments lead to an incremental cost of wind energy, which at the current stage is hard to cover for countries with limited access to financial markets and demanding development agendas. In terms of infrastructure, connecting wind farms to the grid is an expensive undertaking that requires government support. In addition, wind energy can have a negative impact on grid stability, which is already less stable in Africa than outside the continent. These grid harmonization costs are currently all billed to the project sponsor. Technical information on wind energy and its real potential is still not widely disseminated on the continent. Wind energy projects rely heavily on debt financing, therefore interest and investments into wind energy are highly pro-cyclical and sensitive to booms and busts in private sector liquidity. In addition, PPP structures are still perceived as high risk for private investors, even more so as local knowledge of wind energy application remains scarce, and that there remains a lack of qualified people as well as limited experience in conducting PPPs in general.

In Africa, installed wind energy capacity is expected to increase to about two percent of the continent's power generation capacity by 2020. Egypt and Morocco will likely continue to lead the way, with targets to increase wind energy capacity to 20 percent of installed generation capacity in Egypt by 2020; while Morocco is targeting a 2 GW capacity increase in the same period.

Country Context

The Kingdom of Morocco's economy is one of the strongest in North Africa. Morocco's economic growth rate has been around 4.4% for the past decade. Macroeconomic conditions have remained stable. Internal and external balances have been characterized by a generally positive real gross domestic product growth rate, a current account surplus, a sustainable budget deficit, an external debt burden in steady decline, and relatively controlled inflation.

Despite this performance, the government faces a series of challenges in the years ahead. The poverty headcount ratio at national poverty line, which stood at 9% in 2007, compared with 16% in 1999[1], is still too high and threatens social cohesion. Strikes earlier this year have confirmed this concern. Poverty mainly affects young city dwellers within the 15-34 age bracket which made up 78.7% of the urban unemployed in 2004. The overall rural poverty rate was 22% in 2004 and is even higher in some districts. The highest poverty levels and widest social disparities are found in rural areas.

Morocco also depends heavily on imported fossil energy, which constitutes 97% of energy consumed. Oil and coal represent 61% and 28% of primary energy demand, respectively. According to the International Energy Agency, Morocco is North Africa's largest energy importer. Its dependence on imports has steadily risen over time as modest domestic resources have been depleted and energy needs have risen. In 2008, fossil fuels composed 94% of total energy consumption, substantially higher than the world average. Less than 1% of Morocco's fossil fuel is produced domestically.

As a result, Morocco is highly exposed to international oil price fluctuations, which has a destabilizing effect on its balance of payments and a negative effect on its balance of trade. Morocco's dependence on imported fossil fuels is unlikely to decline, given the rapid growth in energy demand—especially electricity demand—unless the energy system is rapidly adjusted to support low-carbon growth.

Morocco's challenge is to meet fast-growing demand without endangering energy security or environmental sustainability. The key objective of the country's energy policy is to improve energy security and mitigate climate change while ensuring access to energy for all citizens and businesses at the lowest possible cost. To meet these objectives, Morocco has resolved to develop its large renewable resources aggressively.

Morocco's carbon dioxide (CO2) emissions have increased 35% from 2000, to nearly 40 million tons in 2006 (Chart 2). The expansion of coal-fired capacity has caused emissions from the electricity sector to rise even faster: these emissions increased 70% between 1997 and 2007. The intensity of emissions (tons of CO_2 emitted per unit of gross domestic product) rose nearly 50% from 1971 to 2007 and is now well above the international average.

Morocco's emissions are expected to continue rising in the future. Under business-as-usual conditions, Morocco's total greenhouse gases are expected to rise from an annual 75.9 million tons of CO_2-equivalent in 2005 to 157.7 million tons of CO_2-equivalent in 2030. This assumes the continuation of existing policies,

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[1] *The World Bank World Development Indicators.*

the maintenance of the current fuel mix for energy supply and generation, and continuing levels of historical demand growth. A mix of actions related to energy supply, energy demand and non-energy sectors can decrease this emission trend substantially.

Realizing currently available low-carbon options would reduce total annual greenhouse gas emissions by at least 20% less than business as usual. When considering only emissions related to energy production and use, the low-carbon scenario would reduce emissions by 25% below business-as-usual.

Sectoral and Institutional Context

Electricity demand has been growing on average 6% per year since the 1990s and doubled from 11 terawatt-hours (TWh) in 1995 to 25 TWh in 2009. As capacity has not kept up with demand, Morocco has increasingly relied on imports from Spain (about 20% of energy consumed in 2009 came from Spain). Although the growth in demand slowed to 4.2% in 2009 because of reductions in the use of energy for irrigation, electricity demand is expected to continue climbing by 8-9% per annum, partly because of gross domestic product growth but also because of increased rates of rural access to the grid. Adding 700-800 MW of power-generating capacity per year will be necessary to meet this demand, prevent shortages, and avoid increasing imports.

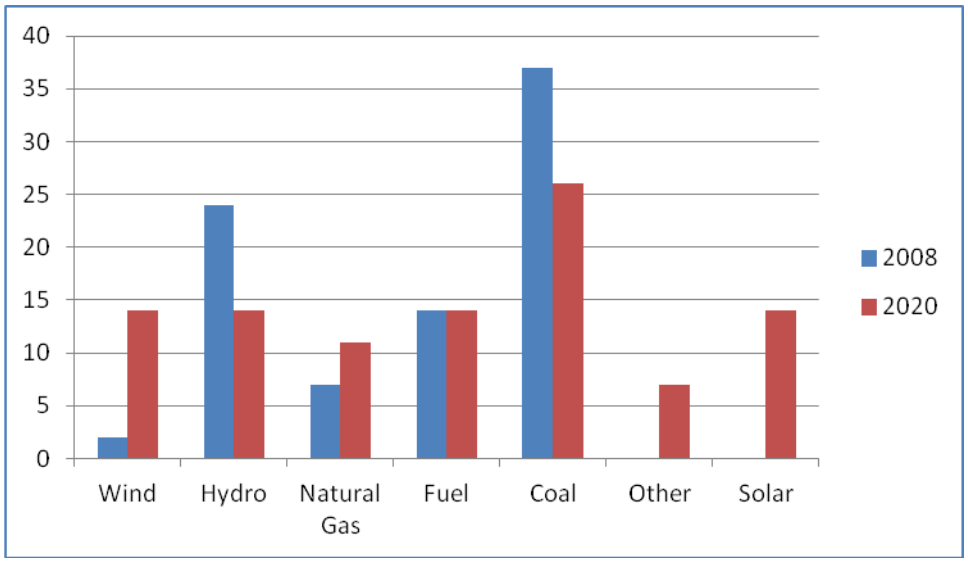
Power generation in Morocco is dominated by coal (between 50 and 70% of all power generated over the last five years, depending on hydro availability). This makes Morocco a carbon dioxide (CO_2)-intensive country, emitting 50% more CO_2 per kilowatt-hour (kWh) than the world average, despite low CO_2 per capita. The only way Morocco can meet its fast-growing electricity demand without increasing its reliance on imports and augmenting its carbon intensity is to develop its vast renewable energy potential. A key objective of the country's energy policy is therefore to commission 6000 MW of renewable capacity by 2020 (2000 MW each for solar, wind and hydro), making up 42% of installed capacity.

Developing the country's solar and wind resources over the next 10 years will require investments of at least $13 billion, a large part of which will come from private investors. Morocco is taking steps to encourage private sector participation in the development of the country's renewable energy, most notably in two ways: (i) by gradually removing subsidies on fossil fuels to give consumers price signals that encourage energy efficiency, on the demand side, and to create a level playing field that makes renewable energy technologies competitive, on the generation side; (ii) by limiting the growth of electricity demand through demand-side management and other energy-efficiency measures.

In 2009, the Government of Morocco formulated a new energy strategy based on five strategic elements: (i) To diversify and optimize the energy mix around reliable and competitive energy technologies in order to reduce oil's share of all energy consumed to 40% by 2030; (ii) to develop the country's renewable energy potential (increase the contribution of renewables to 10% by 2012); (iii) to make energy efficiency a national priority (induce energy savings of 15% by 2020 and 25% by 2030); (iv) to develop indigenous energy resources by intensifying hydrocarbon exploration activities and developing conventional and non-conventional sources of oil; and (v) to better integrate into the regional energy market through closer cooperation and trade with other Maghreb countries and the European Union.

Morocco is currently investing large scale in the deployment of different types of renewable energy. Morocco has developed hydropower (increase from 24.8% to almost recently 33.0% of total installed capacity), wind energy (2.2% in 2008, but rapidly growing), and has conducted first pilots with concentrated solar power. Within the framework of the country's overall strategy for renewable energy, the investment plan of Morocco's Office National de L'Électricité (ONE) for 2010-2020 seeks to increase the share of installed renewable energy capacity to 42% by 2020. It plans to do this by installing 2000 MW of wind energy (compared with 283.5 MW at present), 2000 MW of solar energy and 2000 MW of hydro energy. The ONE Wind Plan, for which CTF funding is sought, will contribute to meeting the target for wind energy.

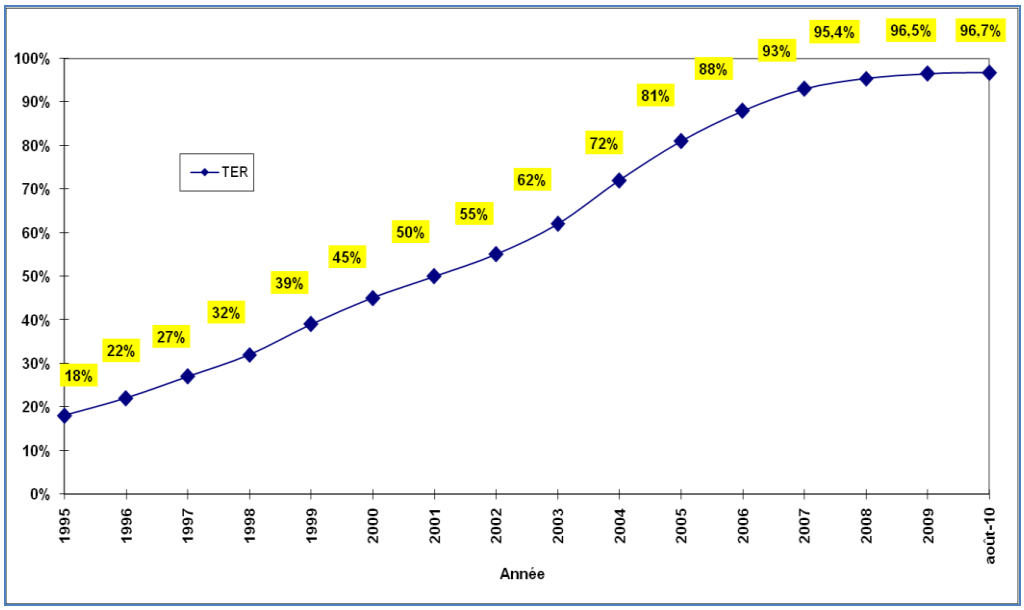
Figure 1: Shares of installed electricity capacity in Morocco 2008 and 2020



Source: ONE

In order to ensure social cohesion and to foster economic growth, Morocco also seeks to harmonize the electricity access rates of rural and urban areas. To harmonize these rates, ONE has launched a number of rural electrification programs since 1996. An additional, African Development Bank (AfDB)-financed component of the ONE Wind Program will further improve rural electrification. Chart 1 shows how Morocco's electricity access rate has evolved since 1995.

Chart 1: Evolution of Morocco's Electrification Access Rate



Source: Office National de l'Électricité

2. RATIONALE FOR THE INVOLVEMENT OF THE CLEAN TECHNOLOGY FUND[2]

Morocco's wind energy plan is a crucial building block of the nation's energy strategy. Morocco's large endowment of wind energy resources has been estimated at 25 000 MW. Its energy plan plans to reap the benefits of this endowment by increasing current installed capacity of 283.5 MW to 2000 MW by 2020. The plan will contribute to the Kingdom of Morocco's objectives of securing and diversifying its energy supply and reducing CO2 emissions by increasing the penetration of renewable energy in the country's energy mix. The plan will also built necessary transmission infrastructure and demonstrate the use of a public-private partnership, thus promoting this business model as a means of developing wind farms power plants in Morocco.

CTF resources will support an institutional transformation. The CTF resources will significantly leverage future investments in the government's ambitious, multi-faceted strategy to enhance energy security while pursuing a low-carbon path. The CTF investment of 125 million US dollars will leverage around 2,166.43 billion US dollars – this is a leverage factor of around 17. CTF funding will buy down the costs of low-carbon growth. Wind farms, their hydro-storage and the related transmission are subsidized with soft financing. CTF and AfDB financing enable the components to achieve the required rate of return by the private sector, allowing for financial closure of the public-private projects. Subsidizing transmission, storage and enabling ONE to be a credible partner in t the public private structure decreases the cost of clean energy, which leads to greater interest from the private sector. More particularly, this wind plan will help to (i) reduce

[2] The project was assessed with CTF investment criteria and that assessment is presented in Section 7. The main points that justify use of the CTF funds are highlighted in this section.

Morocco's dependence on imports; (ii) promote national expertise, and develop technological know-how; (iii) protect the environment, and mitigate climate change; (iv) and supply Moroccan households and businesses with a reliable source of energy.

In addition, CTF funding leverages AfDB funding that will also improve rural electrification, allowing the increased demand stemming from increased access to electricity to be covered by renewable energy. The AfDB will finance a rural electrification component of the plan. Improving rural electrification will create more demand for electricity, which the WEP will service with renewable energy. Addressing access to electricity and renewable energy generation in one combined approach allows for environmental and social benefits.

The plan will contribute significantly to Morocco's efforts to reduce greenhouse gas emissions. The lifetime CO_2 offset of the proposed plan will exceed Morocco's annual carbon emissions for 1 year. Implementing the proposed plan will double the wind capacity already installed or under development in Morocco, thereby doubling greenhouse gas emissions reductions.

There is strong demonstration potential at scale, as without CTF financing the transmission infrastructure development could be delayed by years. The ONE Wind Plan has a transformational impact on the Moroccan energy sector. Investment in transmission and distribution infrastructure, as well as energy storage, enables private sector investment in wind energy.

The plan also signals the government's commitment to wind energy and therefore encourages private investors to build up manufacturing factories locally. Implementing a large scale wind plan in an integrated manner will also allow the Government of Morocco and the Moroccan private sector to acquire high tech wind technologies. Estimates indicate that the plan will create about 4500 full time jobs through the wind generation component. These jobs will be additional to about 2000 one-year jobs in lower end through the electrification plan. The plan also estimates to create additional indirect job effects through related create green jobs.

3. PROJECT DEVELOPMENT OBJECTIVE AND PROJECT DEVELOPMENT INDICATORS

The project's principal higher-level objective is to increase of Morocco's wind energy generation capacity. Creating a new green industry and increasing the penetration of renewable energy in the country's energy mix, the project will contribute to Morocco's objectives of a more secure energy supply, energy diversification, CO_2 emission reductions, and increased employment. The rural electrification component of the project aims at increasing access to modern and renewable forms of energy. The rural electrification component is financed by the AFDB and CTF funding is not sought for it. However, the rural electrification component also positively contributes to those activities funding is requested for. Combining rural electrification with a wind generation program allows meeting the increased energy demand through increased access with sustainable, renewable energy. The rural electrification component will create demand that will be met through the wind program with its hydro-storage program.

The main indicators for the project are shown in the Results-based Logical Framework at the start of the Project Appraisal Document. These relate to the share of renewable energy from energy generation, access to energy, CO2 emissions reductions, energy security, progress achieved towards government energy and renewable energy commitments, wind generation and hydro storage, and generation capacity installed.

The project's implementing agency will develop a baseline scenario and monitor the meeting of performance indicators. ONE will include progress made on meeting the performance indicators in its regular reporting. The progress will compared to projected results, international standards, and the performance of similar plans, such as for instances the CTF financed Wind Plan in Egypt.

4. PROJECT DESCRIPTION

The proposed project adopts an integrated approach to renewable energy generation. Since 2009, the AfDB has been collaborating with Morocco's ONE to prepare an investment proposal concerning sustainable projects eligible for CTF funding. Upon ONE's request, the AfDB visited ONE's operations in Morocco in March 2011 and discussed the Bank's requirements for financing a wind energy plan with two components: (A) A wind energy generating system with hydro-storage energy generating system and (B) A rural electrification plan. Component B, the rural electrification component will be financed by the AfDB only and and will create increased energy demand that can be met through the hybrid generating system.

Component A: Wind energy generating system with hydro-storage

Component A consists of constructing wind and hydroelectric generation sites including the related transmission and transmission infrastructure. The Government of Morocco recognizes the necessity to offset the irregularity of wind power with the consistency of hydroelectric power and create an integrated renewable energy generation system that helps make Morocco's electricity supply more reliable. ONE will design and be responsible for constructing transmission lines to evacuate the electricity produced from wind farms and the hydroelectric sites to the national grid. Table 1 below indicates the four subcomponents of the Wind energy generating system, namely two wind farms and two hydro storage facilities.

Table 1: Project Capacity and Estimated Investment by Subcomponents

Subcomponents	Total Capacity	Estimated Total Investment	Start of Construction	Completion of Construction (Expected)
	MW	USD millions		
Tanger2 Wind farm	150	393.44	2013	2015
Koudia El Baida Wind farm	300	896.26	2014	2017
Total wind subcomponents-	**450**	**1,488.70**		
STEP Abeld Moumen	350	308.78	2012	2015
Complexe hydroélectrique M'DEZ - El MENZEL	170	368.95	2012	2015
Total hydro subcomponents	**520**	**677.73**		
Total wind and hydro subcomponents	**1070**	**2,166.43**		

MW=megawatts; USD=United States dollars

Wind will contribute two thirds of the plan's expected generation capacity. Three wind farms of 100-300 MW installed capacity each will be constructed, starting in 2012. Full operational capacity is expected in 2019. The combined capacity of the three wind farms is expected to be 550 MW. All the farms presented

win the context of this project will be tendered as public-private partnerships or as independent power producers.

Hydroelectric generation will contribute a third of the power generated by the plan. The Wind plan includes two hydro facilities: one of 350 MW and one of 170 MW (Table 1). ONE will develop and own both sites. The hydro sites will supply baseload power, an important element in the management of on-site demand and supply. It will displace the need for additional investments in spinning capacity, such as in the gas turbines that usually accompany wind farms.

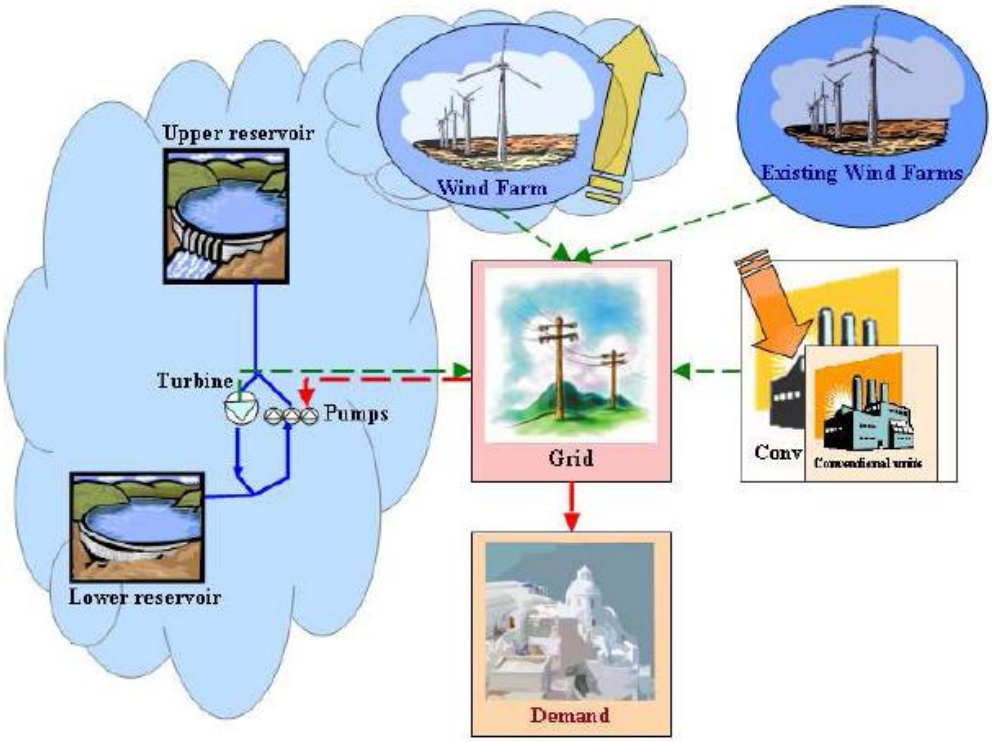
Using hydropower to store wind power is an efficient way to provide reliable power without the need for fossil-fuel based back up. When wind energy is being generated and not consumed, the system will use this energy to pump water to the water heads of hydro power stations. Wind energy is therefore used at its maximum potential.

Creating a combined wind-hydro energy production station is a viable solution that takes account of the preconditions of maximum energy autonomy and limited installation costs. Accordingly, a methodology of optimal wind-hydro solution estimation will be applied to several existing or coming wind-hydro stations, in order to define the most beneficial configuration of the proposed stations. All numerical calculations of this methodology are based on real data, such as long-term wind speed measurements, electrical-load demand, and the operational characteristics of the system components. It will be possible to forward a significant portion of the system's excess wind energy to store water to be used later to generate hydropower. See Figure 2 for a depiction of the flow of energy generation

Component B: Rural electrification

Component B, the rural electrification component will be financed by the AfDB only and will create increased energy demand that can be met through the hybrid generating system. The rural electrification component will finance the connection of 25 provinces to the grid, allowing Morocco's access rate to mount to about 100%. The component will finance the construction of new lines MV and LV switchgear, the installation of transformer stations and the connection to the electrical system of nearly 85,891 households. CTF funding is not sought for component B.

Figure 2: Flow of Energy Generated by a Wind hydro-storage configuration


Upper reservoir
Wind Farm
Existing Wind Farms
Turbine
Pumps
Grid
Conv
Conventional units
Lower reservoir
Demand

5. PROJECT FINANCING

The total cost of WEP is 2,166.43 million US dollars. The proposal at hand requests initial CTF funding of 125 million to the costs. The table 2 below presents the costs by component and type of instrument. The rural electrification component is not included in this project financing table as this component is financed by the AfDB only and CTF funding is not sought for it.

Table 2: Project Financing

Component	**Estimated total cost**	**Equity**		**Debt Coverage**							Total
				CTF – concessional funding			**Financial institution**				
		FH2-SIE-ONE	Private investor	AfDB	WBG	**TOTAL CTF**	WB	AfDB	EIB	Other financial institution	
	US$ million	US$ million	US$ million	US$ million	US$ million	**US$ million**	US$ million	US$ million	US$ million	US$ million	US$ million
Tanger 2 wind farm	393.44	34.43	63.93	30.73		30.73		76.46		187.89	393.44
Koudia El Baida	896.26	78.42	145.64	33.58	0.00	33.58	-	73.42		565.20	896.26
Djebel el Hadid*	199.00	49.75			25.00	25.00	124.25				199.00
Abdelmoumen STEP	308.78			29.98		29.98		86.95	173.01	18.84	308.78
M'Dez El Menzel	368.95			30.71		30.71		92.49		245.75	368.95
TOTAL	**2,166.43**	**162.60**	**209.58**	**125.00**	**25.00**	**150.00**	**124.25**	**329.32**	**173.01**	**1,017.68**	2,166.43

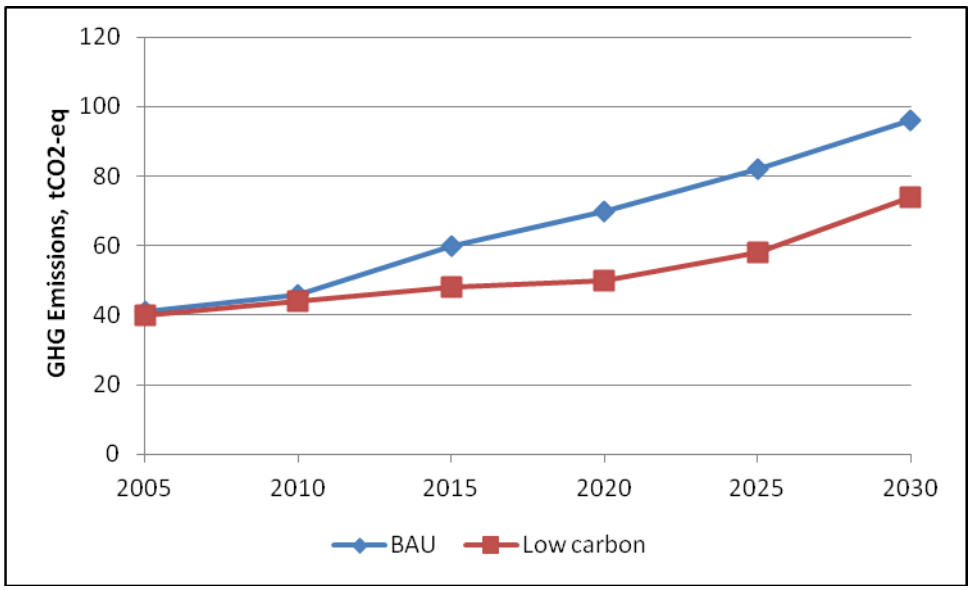
**Djebel el Hadid is not included in the proposed CTF appraisal Document*

6. ALIGNMENT WITH CTF INVESTMENT CRITERIA

7.1. Potential for GHG Emissions Savings

Due to a growing energy demand Morocco has rapidly increasing greenhouse gas emissions both in the business as usual scenario and in the low carbon scenario. The chart 2 below shows the expected evolution of Morocco's emissions under these two scenarios.

Chart 2: Energy-Related Emission Scenarios



BAU=business as usual; CO_2=carbon dioxide; GHG=greenhouse gases; T CO_2-eq=tons of CO_2-equivalent

To offset the CO_2 emissions related to the production of electricity, the Government of Morocco has targeted 2 gigawatts (GW) of wind-installed capacity. ONE already counts four wind farms in operation. The total production of these sites is 283.5 MW. The sites were funded by a mix of concessional and commercial financing. Within the context of the entire WEP, six more sites in three regions are under development with a total capacity installed of 870 MW of energy. The wind farms developed or being developed by ONE in the context of WEP, but not included in this proposal are summarized in Table 3.

Table 3: Already existent Wind Farms in Morocco

	Name	Capacity (MW)	Region
Installed	Abdelkhalek Torres (ONE- IPP)	50	Tetouan
	Parc Eolien modèle (ONE- EPC)	3.5	Tetouan
	Lafarge (private wind farm)	30	Tetouan
	Amogdoul (ONE- EPC)	60	Essouira
	Tanger 1 (ONE- EPC)	140	Tetouan
	Total Installed	**283.5**	
Under Development	Tarfaya (ONE- IPP)	300	Oriental
	Akhfenir (private wind farm)	200	Laayoune
	Bab el Oued (private wind farm)	50	Laayoune
	Haouma (private wind farm)	50	Tetouan

	Bbel Khalladi (private wind farm)	120	Tetouan
	Taza (ONE- IPP)	150	Taza
	Total Under Development	**870**	
Total		***1 153.5***	

MW=megawatts

The ONE Wind Plan will help the Government of Morocco to meets its 2 GW wind energy target and will contribute significantly to Morocco's efforts to reduce greenhouse gas emissions. Considering that Morocco's intensity of emissions is well above the international average, the ONE Wind Plan is very important. The national emission factor is 0.6336 metric tons of CO_2 per megawatt-hour. Using this multiplying factor, ONE has calculated that the 1070 MW of WEP will reduce greenhouse gas emissions to the equivalent of 33 78 35 52 metric tons of CO_2. The lifetime CO_2 offset of the proposed Plan will exceed Morocco's annual carbon emissions for 1 year. Implementing the proposed Plan will double the wind capacity already installed or under development in Morocco, thereby doubling greenhouse gas emissions reductions.

The ONE Wind Plan is eligible for carbon credits. The proposed components will be eligible for tradable carbon credits under the Clean Development Mechanism. The Bank will assist the accreditation through its African Carbon Support Project (ACSF). The Bank will make the development of Project Idea Notes service, assistance to secure funds to register the CDM project service, and the assistance to commercialise carbon credits to be generated service available to ONE. Additional revenue from the sale of Certified Emission Reductions could even improve the cash flow and financial viability of the components.

7.2. Cost effectiveness and additionality

Without CTF funding, ONE's financial capacity to implement the Plan would be significantly compromised and the plan could be delayed or its scope reduced. CTF funding buys down the cost of energy, making wind energy more competitive. ONE's financial equilibrium would be made vulnerable by the higher cost of wind generation and the associated infrastructure, compared with the average cost of energy generated by ONE using conventional sources. The table 5 below shows ONE's purchasing price of electricity with and without CTF funding.

The CTF's financial support will enable the wind farms to reach financial closure. If current equipment and fuel prices persist, the per-unit cost of wind generation will be higher than that of coal and natural gas-based generating technologies. The tariff analyses summarized in Table 4 reflect that CTF funding is critical for enhancing the financial viability of the Plan Without CTF funding, ONE's financial equilibrium would be made vulnerable by the higher cost of wind generation and the associated infrastructure, compared with the average cost of energy generated by ONE using conventional sources. The Plan's commercial viability is rooted in the strength of ONE's existing business, the AfDB's contribution, and CTF concessional funding.

Table 4: Additionality of the CTF

	Tariff without CTF US$ cents/kWh	Tariff with CTF (*) 20 year maturity US$ cents/kWh	Tariff with CTF (*) 40 year maturity US$ cents/kWh
Price of Kwh paid by ONE	12	11.6*	11.4(**)
Average Electricity selling price (HV/VHV)	10.1		
ONE's subsidy to Wind generated eletricity	1.9	1.5	1.3

Source: ONE – Exchange rate used is September 2011

These calculations are based on a debt/equity ratio of 75/25 and the financial participation of several multilateral development banks as indicated in the financing plan. Return to Equity is hold constant 1ith 11% as current market analysis indicates this as the required Rate of Return for private PPP sponsors.

(*)CTF financing assumptions considered in the simulation are those with maturity 20 years.

(**) CTF financing assumptions considered in the simulation are those with maturity 40 years. The request is to obtain financing conditions with maturity 40 years.

The CTF resources and the loans from the multilateral development banks will be instrumental in attracting sizeable private sector investments in the 2000 MW of wind farms. The CTF's investment will facilitate the replication of the wind energy public-private partnership (PPP) model by exposing ONE to greater expertise in PPPs and by providing the conditions for attracting the private sector in the future. Transmission and distribution networks are essential for crowding in private investors, as they assure investors that power can be evacuated. The investments in water storage and pumping are necessary to stabilize the grid and allow for environmentally friendly and affordable storage of wind –generated energy. Finally, CTF funding will signal private investors that the government is committed to the viability of the planned 2000 MW wind farms.

7.3. Demonstration potential at scale

The proposed project has high transformational potential at the country and regional level. At the country level, the project will help in building a sound foundation for meeting the 2 GW wind energy target set by the Government of Morocco. The country has set ambitious targets to move away from its almost total reliance on imported fossil fuel energy. The development of transmission network will signal to private investors that wind energy is viable and that the Government of Morocco is committed to develop it. Further wind power development is seriously constrained by lack of dedicated transmission network and this requires public financing. Without CTF financing, this infrastructure development could be delayed by years. The ONE Wind Plan will also encourage local manufacturing of wind equipment and services thereby fostering economic development. At the regional level, the proposed Plan adds to the move towards renewable energy in Africa and acts as a signal to investors more widely. The Plan does not only have strong demonstration potential in Northern Africa but is also likely to stimulate the development of

hydro/wind hybrid systems in many other parts of Africa, notably in East Africa and parts of Southern Africa, which are equally well endowed with a combination of wind and hydro resources.

7.4 Development impact and co-benefits

Implementing a large scale wind Plan in an integrated manner will allow the GoM and the Moroccan private sector to acquire high tech wind technologies. The Wind Plan aims at integrating the manufacturing of wind equipment within national industrial activities. GoM will complement physical investments with necessary investments in Human capital and R&D such as establishing specializations in wind engineering, training of wind technicians, fostering of applied R&D and collaborative public private research in the area of wind as well as others.

The Wind Plan is expected to create a significant amount of green jobs. About 700 direct permanent jobs in maintenance of the wind farms, as well as over direct 4200 one-year jobs in construction are being expected. Local manufacturing of the equipment is estimated to create additional jobs. In accordance with international research about 4-5 permanent jobs per MW, implying about 4000-5000 total green jobs created though WEP.

The Wind Plan will significantly increase energy security by increasing the share of domestically produced energy. As indicated in Annex 1, the project will lead to annual cost savings of USD 1.251 billion by replacing fossil fuel imports with indigenously produced and stored wind energy. These annual savings will significantly improve macroeconomic stability.

The rural electrification component of the plan will provide access to electricity to consumers who were previously unable to access modern energy services. The early economic rate of return for consumers is estimated at 21%. The positives externalities of the rural electrification component include job creation, access to information and communication technology, and better provision of basic educational and healthcare services in the 24 districts.

7. LESSONS LEARNED AND INCORPORATED IN THE PROJECT DESIGN

The design of the project has benefited from lessons learned from investments in wind energy as well as public-private partnerships financed by the AfDB and other development partners. The design incorporates the following lessons in particular:

- *Securing adequate natural resources: wind and water.* The Plan will be implemented in a location where wind and water are available. From the results of hydrological and wind potential studies, the implementation will minimize risks to those natural resources.

- *Building a strong and experienced team with access to world-class specialists.* ONE has already installed a wind Plan of 253.5 MW. Useful knowledge transfer will therefore take place, limiting operational and technological risks.

- *Conducting early market sounding.* The sounding for this Plan focused on economic rationale and the robustness of the regulatory framework, and confirmed sufficient investor interest and sound competition.

- *Transparent and well-managed competitive bidding processes will help attract the interest of major international companies at the pre-qualification stage.*

- *Adopting a plan financing design that recognizes that the public sector will have to to subsidize energy transmission and storage to make the wind generation investment attractive to the private sector and, in consequence, enable strong private funding leverage.*

8. IMPLEMENTATION

9.1. Implementation Potential

The wind plan will be implemented by ONE, which has significant experience implementing wind energy projects. ONE is a public company with a monopoly of electricity transmission in Morocco. Its capital amounts to amounting to the equivalent of USD 2.38 billion at the end of 2010 and is 100% owned by the Kingdom of Morocco. To date, ONE has financed 253.5 MW of wind generation capacity and number of hydropower plants. The Wind plan is scheduled to be implemented by component between 2011 and 2017-2019. The wind subcomponents will be structured as public-private partnerships, where private developers selected competitively and according to AfDB procurement rules will play the main role in implementation. The hydro-storage subcomponents will be constructed and owned by ONE itself.

ONE holds a strategic implementation position in the electricity sector, as it is Morocco's incumbent utility and single buyer of electricity. Its main task is to satisfy electricity demand in Morocco at the best possible cost and quality of service. The Ministry of Energy, Mines, Water and the Environment plays a key role in the Moroccan institutional setting for renewable energy. It prepares and defines renewable energy-related strategy and policy, the renewable energy regulatory framework, and renewable energy promotion tools, including the promotion of private sector participation (independent power producers, public private partnerships, and other modalities).

9.2. Governance

In 2010 Morocco was ranked 85th out of 178 countries by Transparency International on corruption and good governance. During the past nine years the country has obtained a score between 3.2 and 3.5 in Transparency International's Corruption Perceptions Index. This poor performance is corroborated by other international indicators on aspects such as business climate and justice.

However, the Government of Morocco has put in place economic and structural reforms to modernize public administration and the financial sector with the aim of improving economic performance and competitiveness. The AfDB has supported Morocco to reform its public administration, which has gradually led to the creation of a new institutional framework.

Within the realm of the present project, risks related to governance are low. The AfDB supervision missions and technical and financial audits will ensure compliance with rules. In addition, the involvement of the highest authorities in Morocco in this project gives a signal that governance risks are very low.

9.3. Stakeholder involvement

Under the supervision of the Ministry of Energy, ONE will coordinate the preparation and implementation of the plan. ONE's role will be to update the ministries of finance and energy on all activities regarding the construction of the wind farms, their connection to the grid, and their operation. ONE's experience operating grid-connected wind farms will allow it to be a serious and respected implementation partner.

9.4. Procurement

The Bank's procurement procedures will apply. All documents that require review by the Bank's procurement department for non-objection will be submitted to the Bank for review and approval. ONE will prepare and review all tender documents, applying agreed procedures for contracting and the supply of equipment. To assist ONE to comply with AfDB procurement procedures, the Bank may provide ONE with technical assistance. The use of international competitive two-stage bidding with pre-qualification will address one of the main risks, namely, the selection of financially and technically appropriate partners.

9.5. Financial Management

In terms of lending arrangements and flow of funds, there will be one loan agreement between the Bank and the Government of Morocco represented by the Ministry of Finance, and a separate loan agreement between the Bank - on behalf of the CTF - and the Government of Morocco (again the Ministry of Finance). A "project agreement" between the Bank and ONE will also be established. Other development finance institutions will be considered in parallel financing consistent with Bank procedures: the AfDB will facilitate the coordination of the parallel -financing arrangements. By virtue of a subsidiary loan agreement between the Government of Morocco and ONE, the Government of Morocco will on-lend the proceeds of the Bank loan to ONE.

The Ministry of Finance will be in charge of loan disbursement arrangements, including supporting documentation, whereas ONE's Finance Department will assume responsibility for the project financial recording, budgeting, reporting requirements. ONE is a well-established organization that has adequately qualified staff with proper systems in place for effective planning, budgeting, accounting and reporting the use of funds in the implementation of the Program.

In line with Bank procedures, and similar to ONE's implementation of other projects of this nature, ONE has established a project implementation unit within its structure to supervise, coordinate and monitor overall plan implementation. The unit is staffed with (i) a qualified project manager, who will head the unit; (ii) three procurement/technical engineers; (iii) two financial specialists; and (iv) environmental engineers. The unit will most likely be assisted by an engineering consultant, who will supervise plan design, engineering, and procurement. A financial advisor has been appointed to assist ONE in structuring the transaction and preparing the financial model. ONE's financial department will be responsible for the financial management of the plan, including recording and reporting. ONE's management team and plan personnel will hold regular meetings to review plan progress.

9.6. Disbursement

The disbursement of the CTF tranche and the AfDB co-financing will occur in accordance with the AfDB Disbursement Rules. During Negotiation, Discussions with the GoM and ONE will be held to decide on the best disbursement method or a combination of methods. According with AfDB rules, the available

disbursement methods are: i) Reimbursement of Payments made by the Borrower; (ii) Payment under a Letter of Credit; (iii) Special Account; and (iv) Direct Payment. Any disbursement or advance will be contingent on the fulfillment of the Bank's rules and guidelines linked to the method used.

9.7. Lending instrument

The AfDB jointly with ONE ask the CTF to provide a financing package of USD 125 million. ONE, in line with its calculations (see table 4) seeks a soft concessional loan. This loan will be repaid over 40 years after a 10-year grace period, with an annual interest rate of 0.25% (25 bps) and a fee option of either a 0.10% (10 bps) management fee on the undisbursed loan amount or a lump-sum upfront fee of 0.25% (25 bps).

9.8. Environmental and Social Safeguard

As an integrated investment program, a Strategic Environmental and Social Assessment (SESA) entitled to 30 days disclosure of information, has been undertaken. The SESA introduces the national environmental and social context, the main expected environmental and social impacts of components and an analysis of the institutional capacity to manage E&S aspects in order to define an environmental and social management framework. In this context, the E&S framework has been designed, defining a series of plans, training programs and processes to ensure compliance with Bank safeguard policies. In addition to those plans, in public consultation, and capacity building programs of ONE's environmental division, the SESA requests the recruitment of three environmental engineers and a social expert who will be in charge of public consultation, resettlements and compensations. This strengthened capacity is linked to a tailored approval process which requests for each component, spread between 2014 and 2017, an adequate environmental and social study (ESIA, ESMP and RAP, REP) to be prepared depending on the components category. The components will then, depending on the category, be disclosed and if in compliance will get Bank's non-objection for disbursement. Obtaining this non-objection by the Bank is the ultimate tool to ensure compliance with AfDB environmental and social requirements.

10. DONOR COORDINATION

The Government of Morocco has made considerable efforts to ensure donor coordination. A Geographic Information System (GIS) has been put into place to enable real time monitoring of the interventions of technical and financial partners by geographical area, sector and financial contribution.. There is a coordination group in the energy sector, which was created at the initiative of the German embassy and the European Commission delegation. Several donors are active in the Moroccan energy sector, through both grants and loans. In particular, besides the AfDB and the World Bank, the Agence Française de Développement, Kreditanstalt fur Wiederaufbau, the European Investment Bank and the European Commission are involved. Coordination currently takes place through regular project-specific meetings of donors and executing agencies. These meetings are an opportunity to coordinate these parties' actions with the actions of other institutions.

11. POTENTIAL RISKS AND MITIGATION MEASURES

The main risks and mitigation measures are summarized in Table 6.

Table 6: Main Risks and Mitigation Measures

Risk Area	Comments	Rating
Regulatory structure	The Government of Morocco has passed laws regarding the promotion of renewable energy,	**Low**
Institutional capacity	National institutions promoting renewable energy (ADEREE, MASEN) and funding it (FDE,) are already operational, with defined guidelines. Wind energy projects have already been successfully implemented.	**Moderate**
Private sector interest/financial viability	Recent renewable energy legislation has created a transparent framework and the first private investors have indicated their interest.	**Low**
Technology	Wind technology is mature and ONE has already worked with it. “Smart grid” techniques are being considered to optimize the use of renewable energy.	**Moderate**
Environmental/Social risk	ONE, in joint cooperation with the AfDB and other development partners such as the EIB has prepared a Strategic Environmental and Social Framework that that defines the adequate social and environmental studies to mitigate the potential environmental and social impacts.	**Moderate**
COMAFTEP’s governance	COMAFTEP has been created to prioritize renewable energy projects, approve funding and has adopted operational procedures and guidelines and a committee.	**Moderate**

Annex I: Fuel savings induced by Project

	Wind Generation		Hydro Storage	
	Tanger II	**Koudia al Baida II**	**Abdel Moumen**	**M'DEZ - El MENZEL**
Installed capacity (MW)	150	300	350	170
Operation hours (h)	3,000	3,700	1,800	1,800
Average Production (Gwh)	450	1,110	630	306
Annual consumed Fuel quantity (ton) saved	135 000	333 000	189 000	91 800
Total Cost savings (Millions DH)	108.48	267.50	151.85	73.73

Source: ONE

Annex II Temporary project execution schedule

Activity	2011				2012				2013				2014				2015				2016				2017				2018			
	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4
Presentation to CTF and approval				■																												
Signature Loan Agreement					■																											
Preparation Disbursement						■																										
Satisfaction of conditions for 1st Disbursement							■																									
Procurement per Components																																
Component A: Wind energy generating system with hydro-storage																																
Sub-component Wind farm Tanger 2				■	■	■	■	■	■	■	■	■																				
Sub-component WInd Farm -Koudia El Baida					■	■	■	■	■	■	■	■	■																			
Sub-component Hydrostorage Abdelmoumen				■	■	■	■																									
Sub-component Hydrostorage M'Dez El Menzel					■	■	■	■																								
Component B: Rural electrification																																
Rural Electrification		■	■	■																												
Project Execution per Components																																
Component A: Wind energy generating system with hydro-storage																																
Sub-component Wind farm Tanger 2												■	■	■	■	■	■	■	■	■												
Sub-component WInd Farm -Koudia El Baida													■	■	■	■	■	■	■	■	■	■	■	■	■	■						
Sub-component Hydrostorage Abdelmoumen							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									
Sub-component Hydrostorage M'Dez El Menzel								■	■	■	■	■	■	■	■	■	■	■	■	■												
Component B: Rural electrification																																
Component B: Rural Electrification				■	■	■	■	■	■	■	■	■																				
Supervision – Implementation Environmental and Social Management							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
Audit project Accounts										■				■				■				■				■				■		

Project Completion																																

Annex III Development Agenda of the Country, Extensive Industry Overview and Donor Landscape (Original in French Available upon request)

Annex IV Supporting Analysis of the Key arguments of the Report (Original in French Available upon request)

A. Key lessons learnt

B. Detailed Implementing Provisions

C. Detailed Financial management and disbursement arrangements

D. Audit arrangements

E. Audit arrangements

F. Environmental and social analysis -