



REREQUEST FOR CEO APPROVAL

PROJECT TYPE: FULL-SIZED PROJECT

TYPE OF TRUST FUND: GEF TRUST FUND

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PART I: PROJECT INFORMATION

Project Title: Promoting Utility-Scale Power Generation from Wind Energy			
Country(ies):	Republic of Sudan	GEF Project ID: ¹	4745
GEF Agency(ies):	UNDP (select) (select)	GEF Agency Project ID:	4726
Other Executing Partner(s):	Ministry of Water Resources and Electricity (MWRE)	Submission Date:	July 11, 2014
		Resubmission Date:	August 12, 2014
GEF Focal Area (s):	Climate Change	Project Duration(Months)	60
Name of Parent Program (if applicable):		Project Agency Fee (\$):	335,955
<ul style="list-style-type: none"> ➤ For SFM/REDD+ <input type="checkbox"/> ➤ For SGP <input type="checkbox"/> ➤ For PPP <input type="checkbox"/> 			

A. FOCAL AREA STRATEGY FRAMEWORK²

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Grant Amount (\$)	Cofinancing (\$)
CCM-3	Investment in renewable energy technologies increased	Volume of investment mobilised	GEF TF	2,699,409	211,196,057
CCM-3	Favorable policy and regulatory environment created for renewable energy investments	Renewable energy policy and regulation in place	GEF TF	836,955	2,753,943
Total project costs				3,536,364	213,950,000

B. PROJECT FRAMEWORK

Project Objective: To overcome barriers to the market development of utility-scale wind farms in Sudan						
Project Component	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Grant Amount (\$)	Confirmed Co-financing (\$)
1. Initial wind farm implementation	INV	Replicability plan for Red Sea wind farms completed after implementation of first utility-scale wind farm in Sudan (Dongola, 100MW)	1.1 Completed design, installation and operation of interface electronics in Dongola wind farm such that islanding problems are avoided and grid stability is ensured.	GEF TF	1,900,000	205,595,000
	TA		1.2 Completed and approved replication and investment plan for the construction of additional wind farms	GEF TF	491,864	--

¹ Project ID number will be assigned by GEFSEC.

² Refer to the [Focal Area Results Framework and LDCF/SCCF Framework](#) when completing Table A.

			<p>in the Red Sea region prepared with the objective of catalysing new investment:</p> <ul style="list-style-type: none"> • Technical component for the Red Sea wind farms to address interface electronics and grid stability, minimisation of environmental impacts (e.g. soaring birds) and development of a prioritised list of practicable wind farm sites. • Finance component for the Red Sea wind farms to support implementation as private-sector IPP projects: address business planning; banking proposal preparation; negotiation with investors; regional development and bottleneck issues (e.g. logistical/accessibility constraints); NAMA development for the Red Sea wind farms to catalyse climate finance. 			
2. Policy, institutional and regulatory framework	TA	Increased wind power investment in Sudan facilitated by the approved and enforced enabling policy, institutional and regulatory frameworks	2.1 Formulated long-term energy policy and regulations for Sudan, including analysis of the cost-effectiveness of financial policy instruments (portfolio standards, feed-in-tariffs, carbon finance, carbon taxation, removal of fossil fuel subsidies, reforms of existing tariffs, accelerated depreciation of turbines, tax credits, capital subsidies, time-of-use tariffs, etc.) for reducing GHG	GEF TF	377,410	1,595,000

			<p>emissions and increasing the energy independence of Sudan.</p> <p>2.2 Developed and endorsed standardised Power Purchase Agreement (PPA) for grid-connected renewable energy projects.</p> <p>2.3 Established and approved dynamic, geographically-zoned feed-in tariff for wind energy in Sudan.</p> <p>2.4 Adopted and approved secondary legislation relevant to wind energy developed for catalysing private sector investment in wind energy projects, including a Public-Private Partnership Act and an Independent Power Producers Act.</p> <p>2.5 Formulated and adopted grid code for the interconnection of variable renewable energy sources.</p> <p>2.6 Established and operational inter-ministerial High Committee for Renewable Energy for providing cross-sectoral perspectives and high-level political support for clean energy.</p> <p>2.7 An operational “one-stop shop” (OSS) established for wind energy investors and developers housed jointly by the Investment and</p>			
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			Regulatory Departments of the Ministry of Water Resources and Electricity.			
3. Strengthening the wind technology support and delivery system	TA	Enhanced stakeholders' technical and planning know-how and technological capacities for wind energy power initiatives	<p>3.1 Developed and approved wind atlas for Sudan in a GIS system, with additional layers for geology, geomorphology, land ownership and type (e.g. protected areas / forests), settlements and routes of migratory birds.</p> <p>3.2 Local experts, technicians and practitioners capacitated to prepare and conduct site study visits during construction, interconnection, operation and maintenance of the initial wind farm.</p> <p>3.3 Approved RE-related curricula of specialised universities and the National Energy Research Centre (NERC).</p>	GEF TF	420,000	1,352,500
4. Adaptive learning and replication plan	TA	Conditions enabled for leveraging significant additional investment and knowledge of best practices shared nationally and regionally	<p>4.1 Documented lessons-learned, experiences and best practices related to the development of the Dongola wind farm compiled and disseminated for other wind farm projects in Sudan.</p> <p>4.2 Completed regional workshops for transferring knowledge and capacity to Sudan from relevant regional countries (e.g. Egypt, Morocco, Kenya).</p>	GEF TF	180,000	1,022,500

	Subtotal		3,369,274	209,565,000
	Project management Cost (PMC) ³	GEF TF	167,090	4,385,000
	Total project costs		3,536,364	213,950,000

C. SOURCES OF CONFIRMED COFINANCING FOR THE PROJECT BY SOURCE AND BY NAME (\$)

Please include letters confirming cofinancing for the project with this form

Sources of Co-financing	Name of Co-financier (source)	Type of Cofinancing	Cofinancing Amount (\$)
National Government	Ministry of Water Resources and Electricity	Grant	213,000,000
National Government	Ministry of Petroleum	In-kind	200,000
National Government	Ministry of Petroleum	Grant	50,000
National Government	Higher Council for Environment and National Resources	Grant	200,000
National Government	National Energy Research Centre	In-kind	250,000
GEF Agency	UNDP	Grant	250,000
Total Co-financing			213,950,000

D. TRUST FUND RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY¹

GEF Agency	Type of Trust Fund	Focal Area	Country Name/ Global	(in \$)		
				Grant Amount (a)	Agency Fee (b) ²	Total c=a+b
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
Total Grant Resources				0	0	0

¹ In case of a single focal area, single country, single GEF Agency project, and single trust fund project, no need to provide information for this table. PMC amount from Table B should be included proportionately to the focal area amount in this table.

² Indicate fees related to this project.

F. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

Component	Grant Amount (\$)	Cofinancing (\$)	Project Total (\$)
International Consultants	1,401,864	2,500,00	3,901,864
National/Local Consultants	570,000	100,000	670,000

G. DOES THE PROJECT INCLUDE A “NON-GRANT” INSTRUMENT? No

(If non-grant instruments are used, provide in Annex D an indicative calendar of expected reflows to your Agency and to the GEF/LDCF/SCCF/NPIF Trust Fund).

³ PMC should be charged proportionately to focal areas based on focal area project grant amount in Table D below.

PART II: PROJECT JUSTIFICATION

A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN OF THE ORIGINAL PIF⁴

A.1 National strategies and plans or reports and assessments under relevant conventions, if applicable, i.e. NAPAS, NBSAPs, national communications, TNAs, NCSA, NIPs, PRSPs, NPFE, Biennial Update Reports, etc.

No changes.

A.2. GEF focal area and/or fund(s) strategies, eligibility criteria and priorities.

No changes. In accordance with Objective 3 of the GEF Climate Change Focal Area Strategy for GEF-5, the project will promote investments in renewable energy.

A.3 The GEF Agency's comparative advantage:

No changes: the GEF Agency's comparative advantage is as detailed in the PIF. Having undertaken the project preparation process, including two site visits and extensive stakeholder consultations, the GEF agency has further strengthened its ties and contacts with the relevant stakeholders.

A.4. The baseline project and the problem that it seeks to address:

The implementation of Sudan's first wind farm, in Dongola (100 MW), will be phased over the five-year lifetime of the UNDP-implemented, GEF-financed project, instead of being built all at once as originally envisaged. The construction schedule is:

2014: 5 MW
2015: 20 MW
2016: 25 MW
2017: 25 MW
2018: 25 MW

The phasing of the Dongola wind farm implementation introduces challenges and opportunities. The UNDP-implemented, GEF-financed project will help to address some of the challenges and take advantage of the opportunities that arise.

The principal challenge lies in planning and procurements for a project that will be implemented in stages over five years rather than in a single stage. Wind farms are often designed in conjunction with the selected turbines and laid out in a configuration so as to produce the optimum amount of power for a given site. Considerations will have to be made to design a wind farm that will be implemented in phases, and for which the turbines to be purchased in later phases may not be known in advance as the tendering will not have occurred. A strong design team and project management will be needed to ensure the smooth development of the project. Aside from the technical challenges, there are also procurement challenges with respect to modifying a contract that was initially intended to be 100 MW in a single phase to now be phased over five years, and ensuring that pricing remains competitive.

The opportunities arise in learning throughout the implementation process. Whereas typically lessons are learned from one project to be utilised in a future project, in this case lessons learned in the first phase can be immediately applied in subsequent phases. It also allows implementation to begin immediately, with minimal additional studies since the issues associated with the first-phase 5 MW wind farm are quite different from those for a 100 MW wind farm. Some of the

⁴ For questions A.1 –A.7 in Part II, if there are no changes since PIF and if not specifically requested in the review sheet at PIF stage, then no need to respond, please enter "NA" after the respective question.

studies performed earlier for the Dongola wind farm have overlooked significant aspects, such as evaluation of the effects on bird life in the EIA or grid integration aspects in the feasibility study. The UNDP-implemented, GEF-financed project will support these studies and therefore enhance the operational and environmental robustness of the wind farm.

Key studies, templates, protocols, guidelines and lessons-learned reports arising from the project's support to the Dongola wind farm will be completed by the middle of 2017 (i.e. in the third year of project implementation), informed by the 50MW (i.e. half) of Dongola's capacity that will have been installed by end-2016. This time-line allows for consideration of the key findings/lessons-learned from installation of the first 50MW at Dongola; allows the use of project-generated materials (e.g. for training purposes at Dongola) for the remaining 3 years of the project lifetime; and means that the materials – and, equally importantly, awareness/understanding of them – will be in place in readiness for the commencement of the Red Sea farms a year later.

With Sudan's relatively small grid capacity, upon completion of the Dongola wind farm the installed wind capacity will be approximately 3% of the total installed capacity. At times of high wind energy output and low overall loads, wind penetration on the grid may reach 10%. On the other hand, Sudan has excellent hydro-power penetration, with approximately 58% of installed capacity and 79% of generated energy coming from hydro-power. There is thus excellent potential to use the hydro-power to stabilise a grid with a large percentage of variable renewables, whether wind or solar. This will allow Sudan to surpass one of the obstacles to development of significant renewable energy capacity in countries with relatively small grid capacities. This stabilising and facilitating role of hydro-power has hitherto not attracted any attention, but it will be addressed as part of the UNDP-implemented, GEF-financed project. The phasing of the Dongola wind farm will help the development of a stable grid by gradually adding-in wind power in increasing quantities, which in the first couple of years will not be sufficient to disturb the grid and hence will allow time for operators to learn proper control and regulation of the wind farm.

A. 5. [Incremental /Additional cost reasoning](#): describe the incremental (GEF Trust Fund/NPIF) or additional (LDCF/SCCF) activities requested for GEF/LDCF/SCCF/NPIF financing and the associated [global environmental benefits](#) (GEF Trust Fund) or associated adaptation benefits (LDCF/SCCF) to be delivered by the project:

The project, in conjunction with the Ministry of Water Resources and Electricity, the Ministry of Petroleum, the Higher Council for Environment and National Resources, and the National Energy Research Centre, will enable the direct implementation of 100 MW of wind power and will establish the framework for a further 220 MW of planned wind farms, helping Sudan achieve its long-term goal of 600 MW of wind power.

Through the phasing of the Dongola wind farm, the goal is that the wind farm will act as a five-year teaching facility where it will be possible, for an extended period, to view and learn from the various phases of wind farm construction, commissioning and operation. Dongola will, in effect, be five small wind projects, rather than a single large one, allowing for much greater experience development and adaptive management, and thus reduction of risk.

The vision of the project is to put in place the key elements that enable wind development and reduce the associated risks. These include:

1. Support to the construction of an initial wind farm in phases.
2. Support to using the initial wind farm as a vehicle for capturing and disseminating wind power experience.
3. Support to the development of a geographically-calibrated feed-in tariff (FiT) to encourage private sector investment.
4. Creation of a regulatory framework to encourage the development of wind projects.
5. Creation of a single entity, a “one-stop-shop”, to streamline the wind farm development process.
6. Development of a NAMA to help mobilise climate finance to support wind power projects.

A.6 Risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and measures that address these risks:

Risk	Rating	Mitigation
Political Risks	Medium	<p>Although there is currently a strong political will and commitment to tackle the electricity access challenges in Sudan and an objective to see the share of renewable energy in the national energy mix increased, a change of national circumstances could lead to potential policy reversals that may impact the energy policy and discourage private investment. However, energy security (i.e. utilisation of domestic energy sources and reduced reliance on imports) is now a national priority following the loss of oil fields to South Sudan. The Government is showing growing interest in wind energy, and the UNDP-implemented, GEF-financed project will work closely with Government entities to enhance the enabling conditions for wind energy, with a particular focus on catalysing private sector involvement.</p> <p>Still, the Government may fail to marshal the necessary resources or coordination amongst its entities to bring about the desired legislative and regulatory reform. MWRE already faces a significant burden in meeting rising demand for electricity. Implementation of policy reforms requires the involvement of MWRE, MoP, the Cabinet of Ministers and other Government bodies. The necessity to coordinate between these entities represents one of the risks to successful implementation of the project.</p> <p>Private sector investment in renewable energies on a large scale is currently non-existent in Sudan. Electricity generation is still largely centralised. Provisions for a less controlled environment (e.g. PPPs) will be a serious incentive for private sector investors to invest. Another critical issue is to create the enabling regulatory conditions for the establishment of IPPs for the implementation of wind farms. Adoption of appropriate policy and regulatory changes will be assured through involvement of the stakeholders concerned (including the key Government ministries) at all stages and through intensive involvement of project experts in conciliation processes.</p> <p>UNDP will rely on close relations with MWRE and other counterparts. Through close participation, UNDP will aim to spur action.</p> <p>Sudan's need for electric power and previously demonstrated commitment to building power projects indicates that there is a will to move forward. The project supports existing Government policy to encourage renewable energy and bring private developers into the market.</p>
Private investors do not find wind investments sufficiently attractive	Medium	<p>The project will support the Government to provide the regulatory framework for grid-connected renewables, consisting of grid access, feed-in tariffs, incentives and concession/licensing terms and conditions. The project will help prepare high-quality feasibility studies, investment appraisals, business plans and bankable proposals that will help decision-making by IPPs and financial institutions.</p> <p>The existence of a clear regulatory framework and appropriate feed-in tariff, as well as an initial operational wind farm (Dongola) and technical capacity, will go a long way to mitigating risks seen by the private sector and attract investors seeking to profit from the environment created by these developments. There is considerable interest from private investors who already have large agricultural projects in Sudan to supply their investments with electricity. Given that they have already invested in</p>

		Sudan, they are familiar with the investment climate. Investment in energy infrastructure is seen as a means to support their other investments.
Government finds it hard to commit to commercially attractive feed-in tariffs and/or other incentives	Medium	<p>The feasibility studies for wind farms in Sudan have shown that wind electricity can be competitive with conventional fossil fuels. As such, given that the Government of Sudan is already paying for conventional electricity, the Government can realise savings and benefits by investing in wind energy. Thus, the feed-in tariff constitutes an attractive option to the Government of Sudan. As part of the UNDP-implemented, GEF-financed project, the feed-in tariff will be geographically sensitive to take into account the wind resources in various locations, ground conditions, proximity to the grid, and other such factors that help to create a feed-in tariff that appropriately balances the creation of incentives for investors while providing the Government of Sudan with the most competitive electricity prices.</p> <p>The project will also bring in international experience (e.g. from European countries) to advise the Government on setting an appropriate legal and regulatory framework for wind development. The project will assist the Government to identify ways of raising funds to budget for feed-in-tariffs, and use dynamic modeling to identify the best combination of financial instruments (i.e. least socio-economic cost) to support wind farm development.</p> <p>Co-financing already committed guarantees a minimum level of activity in wind energy during the project years. Thereafter, the benefits of wind energy should be well demonstrated to encourage Government action.</p>
Climate Change Risks	Low	<p>The risk that climate change will make it less likely that wind projects will be implemented is low due to the low climate sensitivity of wind power in Sudan. First, the NAPA (2007) observes that the occurrence of extreme weather events in the form of wind storms is rare. Second, the impact of higher air temperature on changes in air density (leading to power loss) is insignificant. Third, as climate change adversely affects hydro-power (through reduced river flows and higher evaporative losses), Government and private sector attention will be drawn to the potential of wind power.</p> <p>Consideration of long-term wind patterns and expected shifts as a consequence of climate change will be taken into account when the wind farms are planned.</p>
Environmental Risks		
<ul style="list-style-type: none"> • Low-frequency noise 	Low	Current wind turbine technology is advanced in terms of minimising low-frequency noise. In order to ensure that this does not become a detrimental issue for communities and wildlife, the environmental and social impacts of low-frequency noise generated by wind turbines will be duly addressed in EIAs and SIAs.
<ul style="list-style-type: none"> • Migrating Soaring Birds and residents birds 	Low	There is a real risk to bird life (migrating or resident birds) in Sudan. This risk will be mitigated by collaborating with the UNDP-implemented, GEF-financed project, “Mainstreaming Conservation of Migratory Soaring Birds into the Key Productive Sectors Along the Rift Valley/Red Sea Flyway”. As part of the PPG, site visits and surveys undertaken in cooperation with the MSB project have revealed that bird risks are not likely to be significant at the site of the Dongola wind farm. Further analysis and surveying will be undertaken as part of the project. The project will bring to Sudan a level of diligence in the wind farm ESIA process that has not been present thus far.

<ul style="list-style-type: none"> • Risk to settlements 	Low	<p>Noise and shadow flicker from wind turbines can be calculated at various locations with respect to the wind turbines. Strict EU and US guidelines exist for noise levels and light fluctuations. These standards will be respected and taken into account in the planning stages. As part of the project outcomes, the strengthening of ESIA guidelines will ensure that wind farm developers adequately take these considerations into account in order to receive approval.</p>
Lack of technical capacities	High	<p>The project includes significant capacity building and outreach components to help overcome this risk. The project will use the individuals trained to implement wind farms under the project, thereby providing immediate use for the knowledge they have acquired and providing them with immediate income from it.</p> <p>The phasing of the Dongola wind farm over the project lifetime provides an opportunity for continuous training and testing of personnel . This sort of long-term, engaged, practical training is much more likely to result in permanent technical capacities than any short-term training course and should mitigate a great deal of the risk associated with lack of technical capacity.</p>
Nationally-appropriate technology	Moderate	<p>Although wind energy technology is mature, its reliability relies strictly on the local context of operation. In recent years manufacturers have developed packages to equip turbines for high-temperature areas and high-dust areas. The experience gained by manufacturers operating in such areas (e.g. Egypt) in recent years will help to mitigate this risk.</p> <p>Consultants hired for the project will be tasked with studying and emphasising appropriate technology for the ambient environment.</p>
The security situation in Sudan may pose some risks or perceived risks.	Low	<p>The locations of the principal activities in the project (Dongola in the North State, Red Sea, Khartoum) are secure. North State is politically stable and has not experienced a war or tribal conflict since 1895. All three locations are in Minimal, Low or Moderate threat level areas as identified by the UN (http://undss-sudan.org/files/docs/Sudan_SLS_Map.pdf).</p> <p>The majority of the rest of the country is stable, though certain regions, notably Darfur and the border area with South Sudan, have experienced instability in recent years. The impacts of these localised sources of instability on national replication of wind power are considered low. Darfur is, for example, served by an isolated thermal power plant (not connected to the national grid), so the implications for conflict in Darfur on grid infrastructure are minimal. The trend of conflict in Darfur is moving towards settlement. The signing of the Darfur Peace Agreement in Doha 2011, the processes of peace dialogue between different Sudanese political parties and the international support for this peace dialogue (through the mediation of the African Union, the UN and others) are all positive trends towards ending conflict in Sudan.</p> <p>The average per capita electricity consumption on Sudan’s national grid is currently 233 kWh/per capita. The Sudan medium-term power strategy is aiming to raise consumption to 572 kWh/ capita and the electrification rate from 27% to 45% by 2016. A drop in electricity demand as a result of conflict (and hence impact on the viability of wind farms selling power to the grid) is highly unlikely because unmet electricity demand is already very high and also because the areas of highest electricity consumption are not adjacent to the conflict areas in Darfur. Moreover, disturbances serious enough to affect power demand would also presumably affect the ability of conventional power plants to operate - whether because of supply of fuel, supply of spare parts, or ability of local and international (for maintenance) worker to arrive on-site and work. These aspects would make the Dongola wind</p>

		<p>farm, which is situated in a stable region and operates without fuel, more critical in times of disturbance, not less.</p> <p>Secure travel routes will be planned for the transport of wind turbines and other equipment (e.g. from Port Sudan to inland locations), and escorts from MWRE will be provided where necessary.</p>
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A.7. Coordination with other relevant GEF financed initiatives

The most relevant cooperation is with the GEF-financed Migratory Soaring Birds (MSB) project (PMIS 1028). The project will benefit from the MSB project, and will also benefit the MSB project by supplying data to its ornithological database. The MSB project has developed protocols for assessing the impact of wind farms on birds. As part of the project preparation phase for the UNDP-implemented, GEF-financed project, a preliminary assessment of the potential impact of the Dongola wind farm on species in the region was performed.

The assessment relied on a site visit by Mr. Marcus Kohler of Bird Life International, and on the use of the Migratory Soaring Birds Tool (MSB Tool) developed by the MSB project: this contains migration route data for 83 species of migratory soaring birds that occur across the Middle East and North-East Africa. The tool is intended as a source of preliminary site-scale information to be accessed at the earliest stages of the development planning process. It is designed to inform and complement subsequent Environmental Impact Assessments (EIAs) and is considered a complement, not an alternative, to detailed, on-the-ground evaluations.

The site visit revealed that the site is probably of low ecological importance. There were no significant wildlife observations during the period spent on-site. Mr. Kohler did recommend that appropriate ornithological surveys be undertaken and that the Integrated Biodiversity Assessment Tool (IBAT) be used in addition to site surveying as the most authoritative source of wider biodiversity information.

The MSB Tool presents information from a number of sources, primarily Important Bird and Biodiversity Areas (IBAs). However, it should be noted that Sudan is an especially data-poor country. The information currently available for the Dongola project areas is limited. A search at Dongola (20km radius) produces only seven satellite tracking records for White Stork and a forecast that 16 species of soaring birds may potentially occur within the area. The assessment places the site in the ‘unknown sensitivity’ category. However, this does not mean that the site is necessarily of no importance for soaring birds: indeed, the assessment also shows that the known ranges of a number of globally-threatened species with high inherent vulnerability to collision (SVI scores) could potentially occur in the area, including declining species such as the Lappet-Faced Vulture, the Saker Falcon and the Eastern Imperial Eagle. The ornithological surveys to be conducted as part of the UNDP-implemented, GEF-financed project will be valuable not only to the Dongola project, but also to contributing to the MSB Tool database.

It is important to note that the MSB Tool only addresses soaring bird species and the Dongola site should also be assessed in terms of other vulnerable taxonomic group, both avian (e.g. bustards) and non-avian (e.g. bats). A more detailed ornithological survey will be carried out as part of the project.

B. ADDITIONAL INFORMATION NOT ADDRESSED AT PIF STAGE:

B.1 Describe how the stakeholders will be engaged in project implementation.

Stakeholder	Role
Ministry of Water Resources and Electricity (MWRE)	MWRE is the implementing partner (executing agency) for the project. As such, MWRE will be the principal Government entity involved in the project. The main role of MWRE is the implementation of Dongola wind farm and to formulate policies, strategies and action plans for the supply of electricity in Sudan, with a key focus on diversifying Sudan’s electricity mix to include renewables. MWRE will also host the “one-stop-shop” unit that will act as a point of contact to support wind farm developers. The main activities of

	<p>MWRE under the project are:</p> <ul style="list-style-type: none"> • Implementation of wind farms • Support to the policy and regulatory reforms • Use of Dongola wind farm implementation as a training facility to support national capacity building • Hosting a central point to support investors in private wind power (a “one-stop shop”) • Installation and monitoring of wind measuring equipment • Data analysis and reporting • Site selection and preparation • Technical economic and environmental studies • Building the local capacity for wind installation operation and maintenance
<p>Renewable Energy Directorate, Ministry of Petroleum (MoP)</p>	<p>The Renewable Energy Directorate of the Ministry of Petroleum is carrying out extensive wind energy resource mapping along the Red Sea coast that will provide input for the future development of wind farms in the Red Sea region.</p> <p>Measurements in other parts of the country have thus far been geographically fragmented and at relatively low heights (up to 40 m). Modern wind turbines of the types expected in Sudan have hub heights of some 80m, and therefore require measurements at 60m or higher. Creation of a reliable wind atlas is a central component of developing a national wind programme and will be the primary responsibility of the Renewable Energy Directorate.</p>
<p>Higher Council for Environment and Natural Resources (HCENR)</p>	<p>As the national focal point for climate change under the UNFCCC, HCENR is responsible for coordinating National Communications, the development of Climate Change Action Plans, NAPAs, Technology Needs Assessments and NAMAs. Accompanying the development of NAMAs, HCENR has a specific plan to develop a Low Emission Development Strategy for Sudan as an umbrella structure for NAMAs. Further, HCENR is the Designated National Authority (DNA) and is central to climate finance activities in Sudan. HCENR is also responsible for assessing EIAs and SIAs for wind farm developments in Sudan in accordance with the Environment Protection Act.</p> <p>HCENR's primary responsibilities under the project are as follows:</p> <ul style="list-style-type: none"> • Training and participation in conducting EIAs for wind projects, specifically items of special concern to wind farms such as bird and bat studies. • Awareness-raising and mobilisation to promote wind applications for power generation. • Advocacy for wind energy application as a clean source of energy. • Assistance to the design and implementation of the NAMA elements of the UNDP-implemented, GEF-financed project.
<p>National Energy Research Centre (NERC, under the Ministry of Science and Technology)</p>	<p>NERC is the primary institute at the national level for conducting research on renewables in Sudan, as well as pilot project implementation. NERC is also involved in all climate change-related studies that are completed under the UNFCCC.</p>

	<p>NERC will be a central partner in the development of capacity building and adaptive training, including training at Dongola, and capturing lessons from Dongola to be utilised in other projects.</p> <p>NERC's main activities are under the project are:</p> <ul style="list-style-type: none"> • Developing and implementation of training programmes • Research in applications of wind technologies • Resources inventory, assessment and evaluation • Supervising the manufacturing of wind models for research purposes in universities • Training of students and the private sector in wind energy technologies and applications • Teaching wind energy courses to undergraduate and postgraduate students in selected Sudanese universities
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B.2 Describe the socioeconomic benefits to be delivered by the Project at the national and local levels, including consideration of gender dimensions, and how these will support the achievement of global environment benefits (GEF Trust Fund/NPIF) or adaptation benefits (LDCAF/SCCF):

The project provides socio-economic benefits through three primary means:

- a) The provision of improved electricity and energy security to Sudan.
- b) The training of individuals to participate in wind projects in the future, enabling them to improve their livelihoods through upgrading of their skills.
- c) Creation of green jobs.

Gender benefits are expected primarily through improved access to electricity, which disproportionately benefits women through the reduction of the need for manual labour.

Global environmental benefits will be achieved primarily through the reduction of fossil fuel consumption and the associated reductions in greenhouse gas emissions. The global GHG reduction benefits of the project will consist of a combination of:

- Direct GHG emission reduction benefits from the Dongola wind farm.
- Indirect GHG reduction benefits resulting from broader market transformation arising from project activities (including market-opening, awareness-raising and supply chain assistance).

Over the lifetime of the UNDP-implemented, GEF-financed project, the direct CO₂ emission reductions attributed to the Dongola wind farm are calculated (conservatively) to be 36,712 tCO₂/year, or 734,200 tCO₂ over the 20-year life of the wind farm. With a GEF financial contribution of \$3,536,634, this translates as a cost of \$GEF 4.82/tCO₂ abated directly. The project is estimated to contribute additional indirect emissions reductions of 522,648 tCO₂.

B.3. Explain how cost-effectiveness is reflected in the project design:

The proposed project is extremely cost-effective as it will utilise relatively limited GEF funds to leverage almost \$214 million of co-financing (a co-financing ratio of over 60). In the absence of the UNDP-implemented, GEF-financed project, the Dongola wind farm would be built but not according to best practices and with greatly reduced potential for replicability and efficient performance. The cost-effectiveness of the project is reflected in its very low GHG abatement cost - less than \$5/tCO₂.

The GEF financing for Outcome 1 (US\$2,391,864) represents the bulk of the GEF financing for the project and has been allocated to support the development of the Dongola wind farm as Sudan's first wind project. The development of Dongola is seen as the most critical step in launching wind energy in Sudan. Success at Dongola will translate into future projects, while a failure at Dongola will set back wind power in Sudan by several years. The current lack of experience and resulting shortcomings in some of the preparatory studies for Dongola indicate that GEF support will be critical in bringing the implementation of Dongola up to international best practice.

The GEF financing for Outcome 2 will consist of grants for technical assistance, which will support the further development of regulations, technical requirements for grid connection, a feed-in tariff, and a centralised "one-stop-shop" to support the development of wind energy in Sudan. Together, these initiatives are expected to foster a regulatory environment for attracting investments for privately-owned, grid-connected renewable energy power generation and for facilitating effective monitoring, quality control and dissemination of the results of the investments made.

The GEF financing for Outcome 3 consists of technical assistance to strengthen the support for wind technology and the delivery of such support. This includes the creation of a wind atlas, overlaid with other geographical information, as well as the development of a well-trained cadre of competent wind professionals in Sudan who are expected to serve as the core of future wind projects.

The GEF financing for Outcome 4 consists of technical assistance to ensure the documentation and dissemination of experience from Dongola, as well as the interaction of professionals from Sudan with others in the region, to further the experience gained and support the integration of wind power in the East African Power Pool, of which Sudan is a member.

C. DESCRIBE THE BUDGETED M&E PLAN:

The project will be monitored through the following monitoring and evaluation (M&E) activities. The M&E budget is provided in the table below.

Project start:

A Project Inception Workshop will be held within the first 2 months of project start with those with assigned roles in the project organisation structure, UNDP Country Office and, where appropriate/feasible, regional technical policy and programme advisors as well as other stakeholders. The Inception Workshop is crucial to building ownership for the project results and to plan the first year annual work plan.

The Inception Workshop will address a number of key issues including:

- a) Assist all partners to fully understand and take ownership of the project. Detail the roles, support services and complementary responsibilities of UNDP Country Office (CO) and Regional Coordination Unit (RCU) staff vis-à-vis the project team. Discuss the roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. The Terms of Reference for project staff will be discussed again as needed.
- b) Based on the project results framework and the GEF CC-M Tracking Tool, finalise the first annual work plan. Review and agree on the indicators, targets and their means of verification, and recheck assumptions and risks.
- c) Provide a detailed overview of reporting and M&E requirements. The M&E work plan and budget should be agreed and scheduled.
- d) Discuss financial reporting procedures and obligations, and arrangements for annual audit.
- e) Plan and schedule Project Board meetings. Roles and responsibilities of all project organisation structures should be clarified and meetings planned. The first Project Board meeting should be held within the first 12 months following the inception workshop.

An Inception Workshop report is a key reference document and must be prepared and shared with participants to formalize various agreements and plans decided during the meeting.

Quarterly:

- Progress made shall be monitored in the UNDP Enhanced Results Based Management Platform.
- Based on the initial risk analysis submitted, the risk log shall be regularly updated in ATLAS. Risks become critical when the impact and probability are high. Note that for UNDP-implemented, GEF-financed projects, all financial risks associated with financial instruments such as revolving funds, micro-finance schemes, or capitalisation of ESCOs are automatically classified as critical on the basis of their innovative nature (high impact and uncertainty due to no previous experience justifies classification as critical).
- Based on the information recorded in Atlas, a Project Progress Reports (PPR) can be generated in the Executive Snapshot.
- Other ATLAS logs can be used to monitor issues, lessons learned etc. The use of these functions is a key indicator in the UNDP Executive Balanced Scorecard.

Annually:

- Annual Project Review/Project Implementation Reports (APR/PIR): This key report is prepared to monitor progress made since project start and, in particular, for the previous reporting period (30 June to 1 July). The APR/PIR combines both UNDP and GEF reporting requirements.

The APR/PIR includes, but is not limited to, reporting on the following:

- Progress made toward project objective and project outcomes - each with indicators, baseline data and end-of-project targets (cumulative)
- Project outputs delivered per project outcome (annual).
- Lessons-learned/good practice.
- AWP and other expenditure reports
- Risk and adaptive management
- ATLAS QPR
- Portfolio level indicators (i.e. GEF focal area tracking tools) are used by most focal areas on an annual basis as well.

Periodic monitoring through site visits:

The UNDP CO and the UNDP RCU will conduct visits to project sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress. Other members of the Project Board may also join these visits. A Field Visit Report/BTOR will be prepared by the CO and UNDP RCU and will be circulated no less than one month after the visit to the project team and Project Board members.

Mid-term of project cycle:

The project will undergo an independent Mid-Term Review at the mid-point of project implementation (2017). The Mid-Term Review will determine progress being made toward the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organisation, terms of reference and timing of the Mid-Term Review will be decided after consultation between the parties to the project document. The Terms of Reference for this Mid-Term Review will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF. The management response and the evaluation will be uploaded to UNDP corporate systems, in particular the UNDP Evaluation Office Evaluation Resource Centre (ERC).

The GEF CC-M Focal Area Tracking Tool will also be completed during the Mid-Term Review cycle.

End of Project:

An independent Terminal Evaluation will take place three months prior to the final Project Board meeting and will be undertaken in accordance with UNDP and GEF guidance. The Terminal Evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the Mid-Term Review, if any such correction took place).

The Terminal Evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental benefits/goals. The Terms of Reference for this evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF.

The Final Terminal Evaluation should also provide recommendations for follow-up activities and requires a management response which should be uploaded to PIMS and to the UNDP Evaluation Office Evaluation Resource Centre (ERC).

The GEF CC-M Focal Area Tracking Tool will also be completed during the final evaluation.

During the last three months, the project team will prepare the Project Terminal Report. This comprehensive report will summarise the results achieved (objectives, outcomes, outputs), lessons learned, problems met and areas where results may not have been achieved. It will also lay out recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the project's results.

M& E workplan and budget

Type of M&E activity	Responsible Parties	Budget US\$ <i>Excluding project team staff time</i>	Time frame
Inception Workshop and Report	<ul style="list-style-type: none"> ▪ Project Manager ▪ UNDP CO, UNDP-GEF 	Indicative cost: 10,000	Within first two months of project start up
Measurement of Means of Verification of project results.	<ul style="list-style-type: none"> ▪ Project Manager will oversee the hiring of specific studies and institutions, and delegate responsibilities to relevant team members. 	To be finalised in Inception Phase and Workshop.	Start, mid and end of project (during evaluation cycle) and annually when required.
Measurement of Means of Verification for Project Progress on output and implementation	<ul style="list-style-type: none"> ▪ Oversight by Project Manager ▪ Project team 	To be determined as part of the Annual Work Plan's preparation.	Annually prior to ARR/PIR and to the definition of annual work plans
ARR/PIR	<ul style="list-style-type: none"> ▪ Project manager and team ▪ UNDP CO ▪ UNDP RTA ▪ UNDP GEF 	None	Annually
Periodic status/ progress reports	<ul style="list-style-type: none"> ▪ Project manager and team 	None	Quarterly
Mid-Term Review	<ul style="list-style-type: none"> ▪ Project manager and team ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team) 	Indicative cost: 40,000	At the mid-point of project implementation.
Terminal Evaluation	<ul style="list-style-type: none"> ▪ Project manager and team, ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team) 	Indicative cost: 40,000	At least three months before the end of project implementation
Project Terminal Report	<ul style="list-style-type: none"> ▪ Project manager and team ▪ UNDP CO ▪ local consultant 	0	At least three months before the end of the project
Audit	<ul style="list-style-type: none"> ▪ UNDP CO ▪ Project manager and team 	Indicative cost per year: 3,000	Yearly
Visits to field sites	<ul style="list-style-type: none"> ▪ UNDP CO ▪ UNDP RCU (as appropriate) ▪ Government representatives 	Being a GEF-financed project, paid from IA fee and operational budget	Yearly
TOTAL indicative COST Excluding project team staff time and UNDP staff and travel expenses		US\$ 93,000 (+/- 5% of total budget)	

PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

- A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT(S) ON BEHALF OF THE GOVERNMENT(S):** (Please attach the [Operational Focal Point endorsement letter\(s\)](#) with this form. For SGP, use this [OFP endorsement letter](#)).

NAME	POSITION	MINISTRY	DATE (MM/dd/yyyy)
Babiker Abdalla Ibrahim	Undersecretary	MINISTRY OF ENVIRONMENT, FORESTRY, AND PHYSICAL DEVELOPMENT	12/20/2011



سنة الحزب

Republic of Sudan

جمهورية السودان

Ministry of Environment , Forestry & Physical Development

وزارة البيئة و الغابات و التنمية العمرانية



مكتب الوكيل
Under secretary

DATE: Date: 20 December 2011

التاريخ:

NO:

التمرة:

To: Mr. Yannick Glemarec
Executive Director
United Nations Development Programme
Global Environment Facility Unit (UNDP-GEF)
304 East 45th Street 9th Floor
New York, NY 1007
USA

Subject: Endorsement for Promoting Utility-Scale Power Generation from Wind Energy

In my capacity as GEF Operational Focal Point for Sudan, I confirm that the above project proposal (a) is in accordance with my government's national priorities and our commitment to the relevant global environmental conventions; and (b) was discussed with relevant stakeholders including the global environmental convention focal points.

I am pleased to endorse the preparation of the above project proposal with the support of the GEF Agency(ies) listed below. If approved, the proposal will be prepared and implemented by the Ministry of Electricity and Dams. I request the GEF Agency(ies) to provide a copy of the project document before it is submitted to the GEF Secretariat for CEO endorsement.

The total financing (from GEF, LDCF and/or SCCF) being requested for the project is US\$ 4,000,000 inclusive of project preparation grant (PPG), if any, and Agency fees for project cycle management service associated with the total GEF grant. The financing requested for Sudan is detailed in the table below:

Source of fund	GEF Agency	Focal Area	Amount (in US\$)			
			Project preparation	Project	Fee	Total
GEF TF	UNDP	CC	100,000	3,536,364	363,636	4,000,000
(select)	(select)	(select)				
(select)	(select)	(select)				
(select)	(select)	(select)				
Total GEF Resources			100,000	3,536,364	363,636	4,000,000

In accordance to the utilization of Sudan's allocations in GEF-5 as defined in the System for Transparent Allocation of Resources (STAR).



Sincerely,


Babiker 20/12/2011
Dr. Babiker Abdalla Ibrahim
Undersecretary, Ministry of Environment
and National GEF Operational Focal Point for Sudan

Copy to: Ms. Rola El-Sheik, Convention focal Point for UNFCCC

المقر: مباني رئاسة مجلس الوزراء سابقاً - شارع المك نمر - تلفون: ٧٧٤١٣٩ - ٠١٥ ٧٧٩٤٣١٥ - فاكس: ٠١٥ ٣٩٨٥٦٠٥
Head office : Mek Nimir Avenue, Khartoum, Sudan, Tel:015 7794315 - 774139 - Fax:015 3985605

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF/LDCF/SCCF/NPIF policies and procedures and meets the GEF/LDCF/SCCF/NPIF criteria for CEO endorsement/approval of project.

Agency Coordinator, Agency Name	Signature	Date (Month, day, year)	Project Contact Person	Telephone	Email Address
Adriana Dinu, UNDP-GEF Executive Coordinator & Director a.i		August 12, 2014	Robert Kelly, UNDP-GEF Regional Technical Advisor	+421 915 725 069	robert.kelly@undp.org

ANNEX A: PROJECT RESULTS FRAMEWORK (either copy and paste here the framework from the Agency document, or provide reference to the page in the project document where the framework could be found).

	Indicator	Baseline	Targets End of Project	Source of verification	Risks and Assumptions
<p>Project Objective⁵</p> <p>To overcome barriers to the market development of utility-scale wind farms in Sudan.</p>	<p>Introduction of RE policies and regulations.</p> <p>MWh of power generated by grid-connected wind energy.</p> <p>Number of individuals that benefit from wind-generated electricity.</p> <p>Number of wind power IPPs operating in Sudan.</p>	<p>There is currently no wind capacity in Sudan. The 100 MW Dongola wind farm is planned, as are others.</p>	<p>Construction and operation of the Dongola wind farm, with resulting power generation of 300,917 MWh/year.</p> <p>1.3 million beneficiary individuals per year, calculated on the basis of Dongola’s annual power output and the annual average electricity consumption of a grid-connected consumer (233 kWh/yr).</p> <p>Compilation of lessons-learned, trained personnel and replication manuals to be applied in other wind farms.</p>	<p>Project monitoring reports and final evaluation.</p> <p>As applicable, post-project market monitoring and evaluations.</p>	<p>Security risk: the volatile political and economic situation in Sudan may delay implementation.</p> <p>Political risk: while the Ministry of Water Resources and Electricity (MWRE) has plans to build four wind farms, MWRE has for years been struggling with shortages of funds, labour and skills which strain its human and material resources.</p>
<p>Outcome 1⁶</p> <p>Initial wind farm implementation.</p>	<p>Megawatts of installed grid-connected wind power.</p> <p>Availability of</p>	<p>No Dongola wind farm grid study.</p> <p>No training programme designed or in place.</p>	<p>100 MW of grid-connected wind power installed at Dongola wind farm.</p> <p>Development of guidelines for wind farm-specific EIA considerations (e.g. migrating birds, noise) and other hazards (e.g. civil and military aviation).</p>	<p>Project monitoring reports and final evaluation.</p>	<p>As above.</p>

⁵Objective (Atlas output) monitored quarterly ERBM and annually in APR/PIR

⁶All outcomes monitored annually in the APR/PIR. It is highly recommended not to have more than 4 outcomes.

	Indicator	Baseline	Targets End of Project	Source of verification	Risks and Assumptions
	<p>environmental and social guidelines for implementing wind farms.</p> <p>Successful tendering process for the Red Sea wind farm.</p>	<p>Limited EIA requirements that neglect ecological (notably avian) and community aspects of wind farm investments.</p> <p>Tendering process not yet designed or initiated; without UNDP-GEF intervention, likely to be similar to the Dongola tendering process, with similar deficiencies.</p>	<p>Detailed assessment of identified Red Sea wind farm sites using the tools, templates and protocols developed.</p> <p>Development of Red Sea wind farm tender and investor proposal documents in conjunction with MWRE.</p> <p>Development of a feed-in tariff policy NAMA for wind power in Sudan.</p>		
<p>Outcome 2</p> <p>Policy, institutional and regulatory framework.</p>	<p>Extent to which RE policies and regulations are adopted and enforced.</p>	<p>A bill has been drafted for RE policies.</p> <p>The law aims to establish a legal framework for</p>	<p>Existence of implemented and enforced policies and legislation for renewable energy.</p> <p>Estimation of wind energy production costs in selected regions of Sudan based</p>	<p>Project monitoring reports and final evaluation.</p>	<p>Assuming that the proposed legal and regulatory improvements pass swiftly through the Government and Parliamentary approval process.</p>

	Indicator	Baseline	Targets End of Project	Source of verification	Risks and Assumptions
		encouraging RE projects in Sudan.	<p>on geographical conditions and wind speeds.</p> <p>Design and establishment of a feed-in tariff for wind energy IPPs based on geographical zones.</p> <p>Mandate, membership and operational guidelines defined for the inter-ministerial National High Committee for Renewable Energy (NHCRE).</p> <p>Institutional strengthening and harmonisation of policy agendas of participant institutions for streamlined Committee decision-making.</p>		The financing for the FIT also presents a risk. However, given that wind power is competitive with conventional power in the proposed locations in Sudan, the risk is not specific to renewable power but to the power sector in general. If Sudan can fund power, it can fund wind power.
Outcome 3 Strengthening the wind technology support and delivery system.	<p>Number of individuals and organisations trained and capable of supporting activity in the Sudanese wind market.</p> <p>Existence of a reliable national wind atlas.</p>	<p>Preliminary wind measurements have been carried out as well as some feasibility assessments based on those measurements.</p> <p>MWRE and private sector capacities to plan and implement</p>	<p>Compilation and reconciliation of existing wind data and establishment of wind measurement masts where needed.</p> <p>Integration of wind and other datasets into a GIS system capable of Web-based (off-site) interrogation and analysis.</p> <p>Development of a national map to highlight priority areas for wind development.</p> <p>Establishment of a structured training programme for national experts, technicians, academics and students throughout the construction of the</p>	Project reports.	<p>Lack of interest while the market opportunity is not yet clear to participants (this risk is minimal).</p> <p>Existing datasets for geology, geomorphology, elevation, land ownership, etc. can be compiled and consolidated without intellectual property / institutional ownership barriers.</p>

	Indicator	Baseline	Targets End of Project	Source of verification	Risks and Assumptions
		wind energy investments is limited.	Dongola wind farm to help build capacity and establish strong linkages with educational and vocational courses.		Lack of reporting by market participants, making collection of data difficult.
Outcome 4 Adaptive learning and replication plan.	Establishment of a Quality Management System for Dongola wind farm. Educational tours to wind farms.	There is currently no plan for compiling and disseminating lessons-learned in wind power.	An adaptive learning and replication plan exists and is being used. Establishment of a quality management certification process (e.g. ISO 9001) for Dongola wind farm. Establishment of study tours, networking connections and assuring interaction at regional forums on a regular basis.	Project reports. Obtaining the quality management certificate.	The major risk is garnering interest by convincing individuals that there is a future for wind power in Sudan.

ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

GEFSEC Review Comments	Response
<p>a) Please note that, given the project design, this project will be recommended for CEO endorsement on the condition that there is the materialisation of the co-finance.</p>	<p>Co-finance has materialised from the Ministry of Water Resources and Electricity, as evidenced by the accompanying co-finance letter.</p>
<p>b) Please provide a clear strategy to enhance market development of utility-scale wind farms through removing the barriers in the Dongola wind farm.</p>	<p>The strategy focuses on four elements:</p> <ul style="list-style-type: none"> • Building of the Dongola wind farm in phases over a period of five years and using it during this time to create an intensive practical training facility to create a base of local skills. • Developing an accurate wind resource map and associated FiT to encourage investment in wind energy. • Creation of a central “one-stop-shop” to streamline the wind farm development process for investors. • Support to the grid integration of wind energy to maximise the utilisation of the wind farms to be constructed.
<p>c) Please provide methodology and assumptions to estimate GHG emission reductions.</p>	<p>The grid emission factor has been calculated according to the UNFCCC “Tool to calculate the emission factor for an electricity system”.</p> <p>The project emissions reductions are then calculated using the GEF Council's “Manual for Calculating GHG benefits from GEF Projects: Energy Efficiency and Renewable Energy Projects”, April 16, 2008.</p> <p>Full details are provided in Annex 8-4 of the Project Document.</p>

STAP Review Comments	Response
<p>Rationale for technology selection: The wind resource is to be assessed and a wind atlas developed, but if the wind resource is then deemed to be low, then there would be a risk that the project may not develop further. It is hard to believe that 7 wind farms are planned without careful assessment of the wind source potential having already been undertaken.</p> <p>The PIF states Sudan has "considerable wind resources" and the Second National Communication has identified that wind has high potential, but the only data provided to support this statement give typical mean annual wind speeds of 4.5-5 m/s. Where wind</p>	<p>The available wind resources at Dongola and the Red Sea sites are in the range of 7-8 m/s at 60-80m above ground level, as determined by site measurements for the feasibility studies.</p> <p>The capacity factor of 35% is based on a hub height of 100m, where the average wind speed is 7.85 m/s, with an uncertainty of 10%. At 65m hub height, the average wind speed is 7.41 m/s, with an uncertainty of 7%.</p> <p>The corresponding levelised cost of electricity is expected to be in the range of 9.5-13 US cents/kWh. This is comparable with much of the fossil fuel power used in Sudan, which</p>

<p>has less than a mean annual wind speed of around 7m/s, then wind power may not be economically viable. Based on Table 1, a capacity factor of around 35% is evident which, if correct, is above the global average but does not relate to the low 4.5-5 m/s mean wind speeds quoted. So there appears to be some inconsistency and uncertainty in these calculations. What real data have actually been used for these calculations have to be further clarified in the project document. The quoted \$1.86M /MW installed capacity (with Dongola at \$2056 /MW) is similar to mean costs cited for the USA in 2009 (ranging from \$1200-4400/MW; IPCC, 2011, Chapter 7). Project proponents may explain if these costs include road access, transmission line extensions, etc.</p>	<p>a levelised cost of 11-14US cents/kWh. Therefore, on an economic basis, it may already be effective to displace some of the more costly fossil fuel generation sources with wind power.</p> <p>The \$213 million cost of the 100 MW Dongola wind farm includes \$60 million for basic infrastructure, such as access roads, grid connection and water supply.</p>
<p>Grid reliability: Checking grid stability when operating the one pilot 100 MW wind farm at Dongola will help provide useful experience for the system operators as to how to manage a variable generation system. However, the challenge to the operators will increase as shares of the total generation from wind power increase as replication progresses. It is not clear what share of power will be generated once the 6 wind farms are built but if all renewable electricity plants are adding around 551 MW by 2016 to the projected total capacity of 5180 MW as is stated (Medium Term Power System Development Plan), the proposed 300 MW of wind capacity is likely to remain a relatively small share and hence grid integration should not be a major issue at this stage.</p>	<p>With 300 MW of wind on a 5,180 MW grid, at times of low demand wind can represent more than 10% of the instantaneous power generation. Part of the difficulty with managing wind energy is that the fluctuations may not be linear. Wind power increases with wind speed but falls sharply if the speed exceeds the turbines' cut-out wind speed, resulting in an almost-immediate loss of power that had been at its peak. An instantaneous fluctuation of 10% of the capacity on a grid can be enough to cause power surges and frequency fluctuations, and perhaps destabilise regions of the grid.</p> <p>The proposed amounts of wind on the grid can certainly be managed. Sudan has significant hydro-power which can respond quickly to fluctuations in the grid, given the appropriate control strategies. As part of the PPG, a site visit was conducted to Merowe, the largest (1,250 MW) dam in Sudan. Operators at Merowe reported power ramp rates in excess of 100 MW/min.</p> <p>The goal of this element of the project is to help the Sudan Transmission Company's control centre (responsible for dispatching power stations and managing loads on the grid to ensure that the grid is continuously balanced) to maximise the output from the wind power plants while keeping the grid within its operating parameters.</p> <p>A detailed grid study for the Dongola wind farm has not been conducted in the baseline, and one will be conducted as part of the UNDP-implemented, GEF-financed project.</p>
<p>Removal of barriers: One of the project aims is to demonstrate the technical potential of wind energy for Sudan stakeholders to be achieved with a smaller wind farm than the 100 MW. The technology is mature. Measuring the wind resource is the key to success. If as low as presented, the viability of wind power in Sudan seems questionable without significant government support policies (such as FITs as</p>	<p>Feasibility studies carried out for the wind farms reveal significantly better wind resources, at 7-8 m/s. Since the energy available from the wind scales as the third power of the wind speed, the energy available at 8 m/s is 8 times that available at 4 m/s.</p> <p>As part of the project, more accurate wind measurements for Sudan as a whole are planned, along with establishment of</p>

<p>proposed).</p> <p>Developing a grid code is one critical component to remove integration barriers. A lot of experience exists elsewhere when integrating variable wind power into an existing grid (see IPCC 2011 report on Renewable Energy, chapter 11) but each system differs, so this specific Sudan study is needed. The current mix of generation (unknown) may or may not give specific problems for wind power replications. If developed along with the "large hydro potential", a workable generation mix could result to better managed wind variability.</p> <p>Learning from the experience of other wind farm operators that exist around the Red Sea is a commendable approach, but much of this information is usually commercially-confidential, so it is not clear who will provide this assistance or how much useful information might be obtained. It would be useful to provide some evidence that such information will be forthcoming.</p>	<p>better wind resource maps and design of a FiT that is based on available wind resources and other considerations such as terrain, access to the grid, and development priorities.</p> <p>Development of a grid code to support wind integration is an element of the proposed project.</p> <p>The majority of experience with wind on the Red Sea is in Egypt, where farms owned by the Egyptian New and Renewable Energy Authority (NREA) have a capacity of 550 MW. As a government entity, typical commercial confidentiality does not apply to NREA. Indeed, training is one of NREA's objectives. As such, it will provide training and share knowledge with Sudanese counterparts.</p>
<p>Climate change abatement and risks: The chance of reduced hydro-power generation due to reduced precipitation is acknowledged. Possible future impacts on mean wind speeds and frequency of extreme gales are not mentioned.</p> <p>Monitoring and evaluation: It is stated that GEF funding sought is mainly for supporting the "technical performance" of the baseline wind farms (page 9) but whether this will be done in association with the turbine manufacturers is unclear, as is who exactly will undertake the study, especially given the lack of capacity acknowledged in the proposal. Sudan UNDP has recruited an energy specialist who can oversee the project monitoring, assuming the agency is giving high priority to energy monitoring activities, but more clarity on this is requested.</p>	<p>The risk of extreme weather events is acknowledged. Sudan's National Adaptation Programme of Action (NAPA, 2007, p 18) observes that extreme weather events in the form of wind storms are rare. Wind turbine manufacturers provide "survivability" ratings, guaranteeing the survival of their wind turbines in gales up to the rated speed. Turbines with appropriate survivability will be selected for operation in Sudan.</p> <p>Monitoring performance is a key element of the project. Budget has been allocated for international consultants to support the monitoring and it is expected this will be done in conjunction with the manufacturers. In addition, MWRE has retainer contracts with major international consultants (Lahmeyer International) who can be expected to contribute in this regard.</p>

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS⁷

A. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES FINANCING STATUS IN THE TABLE BELOW:

As part of the PPG process, two extensive consultations were conducted with stakeholders in Khartoum, and meetings were held with the State government in the North State, where Dongola is located. An evaluation of the site for ecological sensitivity was undertaken by an international ornithological expert. An 80m wind measurement mast exists on-site and is collecting wind data, which will prove useful in the implementation phase. The phasing of the Dongola wind farm was discussed extensively with MWRE. The proposed phasing allows MWRE to deploy its own resources for the development of Dongola. The phasing also allows for an extended construction period during which know-how transfer can be planned. Similarly, the establishment of a one-stop-shop for wind energy was an outcome of discussions with MWRE.

Of the main outcomes from interactions with MWRE over the course of the PPG process, support for the regulatory reform process and support for organising knowledge transfer and training emerged as key needs. As a result, the PPG places considerable emphasis on these activities.

PPG Grant Approved at PIF:			
<i>Project Preparation Activities Implemented</i>	<i>GEF/LDCF/SCCF/NPIF Amount (\$)</i>		
	<i>Budgeted Amount</i>	<i>Amount Spent To date</i>	<i>Amount Committed</i>
Local consultants	48,000	33,000	15,000
International consultant	36,000	0	27,000
Travel	12,000	16,000	
Miscellaneous (e.g. workshop organisation, office facilities)	4,000	9,000	
Total	100,000	58,000	42,000

⁷ If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue undertake the activities up to one year of project start. No later than one year from start of project implementation, Agencies should report this table to the GEF Secretariat on the completion of PPG activities and the amount spent for the activities.

ANNEX D: CALENDAR OF EXPECTED REFLOWS (if non-grant instrument is used)

Provide a calendar of expected reflows to the GEF/LDCF/SCCF/NPIF Trust Fund or to your Agency (and/or revolving fund that will be set up)

N/A