PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: FULL-SIZED PROJECT
THE GEF TRUST FUND

Submission Date: November 4, 2009
Re-submission Date: December 8, 2009
Re-submission Date: April 28, 2010

PART I: PROJECT IDENTIFICATION

GEFSEC PROJECT ID[1]: 4163 Project Duration: 60 months
GEF AGENCY PROJECT ID: 4334 COUNTRY (IES): Namibia.
PROJECT TITLE: Concentrating Solar Power Technology Transfer for Electricity Generation in Namibia (NAM CSP TT)
GEF AGENCY (IES): UNDP
OTHER EXECUTING PARTNER(S): Renewable Energy and Energy Efficiency Institute (REEEI), Ministry on Mines and Energy (MME)
GEF FOCAL AREA (S): Climate Change
GEF-4 STRATEGIC PROGRAM(S): CC-SP3 Promoting Market Approaches to Renewable Energy

INDICATIVE CALENDAR	
Milestones	**Expected Dates mm/dd/yyyy**
Work Program (for FSP)	June. 2010
CEO Endorsement/Approval	Dec. 2011
Agency Approval Date	March 2012
Implementation Start	March 2012
Mid-term Evaluation (if planned)	Sept. 2014
Project Closing Date	Dec. 2016

NAME OF PARENT PROGRAM/UMBRELLA PROJECT: N/A

A. PROJECT FRAMEWORK (Expand table as necessary)

Project Objective: To increase the share of renewable energies in the Namibian energy mix by developing the necessary technological framework and conditions for the successful transfer and deployment of Concentrating Solar Power (CSP) technology for on-grid power generation, thereby reducing greenhouse gas emissions.

Project Components	**Indicate whether Investment, TA, or STA****	**Expected Outcomes**	**Expected Outputs**	**Indicative GEF Financing***		**Indicative Co-financing***		**Total ($)**
				($) a	%	($) b	%	c = a+ b
1. Establishment of CSP technology industry.	TA	**1.1** Technology partnership agreements are finalized and a few additional ones created between foreign technology providers and Namibian partners including private sector, academia and government **1.2** Enhanced knowledge of applicable CSP applications in Namibia	**1.1.1** National Technology Transfer (TT) Coordinating Body is operationalised **1.1.2** Partnership agreements in place with at least two partners: (a)South-South and (b) North-South	50,000	33	100,000	67	150,000
2. Market Policy Framework for CSP technology	TA	**2.1** Approved policies supportive of CSP technology	**2.1.1** Approved CSP investment guidelines **2.2.1** Approved	125,000	33	250,000	67	375,000

[1] Project ID number will be assigned initially by GEFSEC.

		applications **2.2** A thriving CSP market in Namibia	CSP technical standards for grid quality					
3. Business Model and Financing Framework for CSP projects	TA	**3.1** Financing institutions/banks providing loans to CSP projects **3.2.** Increased number of CSP installations in the country	**3.1.1** Approved package of financial incentives for CSP projects **3.1.2** Tailored financing packages for CSP technology **3.2.1** Established and enforced national CSP promotion strategies	125,000	33	250,000	67	375,000
4. CSP Pre-Commercial demonstration plant	TA + Investment	**4.1** Improved confidence of the government and citizenry on the techno-economic viability of CSP **4.2** Several replications of the CSP plant	**4.1.1** Detailed techno-economic feasibility reports **4.2.1** Demo CSP plant (5MW) built **4.2.2** O&M and performance reports **4.2.3** Technical performance manuals and standards **4.2.4** Trained local technicians on the design and operation of CSP plants **4.2.5** Engineering curricula that incorporates CSP technology design and applications **4.2.6** Approved monitoring indicators for baseline mid and end-of-project analysis **4.2.6** Documented and disseminated project results	1,246,200	7	17,492,400	93	18,738,600
5. Project management				171,800	33	343,600	67	515,400
Total project costs				A 1,718,000		B 18,436,000		20,154,000

* List the $ by project components. The percentage is the share of GEF and Co-financing respectively to the total amount for the component.

** TA = Technical Assistance; STA = Scientific & technical analysis.

B. INDICATIVE CO-FINANCING FOR THE PROJECT BY SOURCE and BY NAME (in parenthesis) if available, **($)**

Sources of Co-financing	Type of Co-financing	Amount
Project Government Contribution	Grant	746,000
Project Government Contribution	In-kind	450,000
GEF Agency(ies)	Grant	
Bilateral Aid Agency(ies)	Soft loan & Grant- KfW bank, DANIDA	450,000
Multilateral Agency(ies)	Unknown at this stage - EU (EU AID/128320/C/ACT/Multi- ENRTP Priority 5/Lot 11)	770,000
Private Sector	**In-kind**– Polytechnic of Namibia, Chamber of Mines, NamPower, Renewables Academy AG **(**Germany**)**,	520,000
Private Sector	**Cash** – Rössing Uranium Limited, NamWater, Electricity Control Board (ECB)	500,000
Private Sector	**Cash/In-kind** (e.g. plant, installation, commissioning) **–** SUNTEC Namibia (Pty) Ltd	15,000,000
Total co-financing		18,436,000

C. INDICATIVE FINANCING PLAN SUMMARY FOR THE PROJECT ($)

	Previous Project Preparation Amount (a)[2]	Project (b)	Total c = a + b	Agency Fee
GEF financing		1,718,000	1,718,000	171,800
Co-financing		18,436,000	18,436,000	
Total		20,154,000	20,154,000	171,800

D. GEF RESOURCES REQUESTED BY AGENCY(IES), FOCAL AREA(S) AND COUNTRY(IES)*

GEF Agency	Focal Area	Country Name/ Global	(in $)		
			Project (a)	Agency Fee (b)[2]	Total c=a+b
(select)	(select)				
(select)	(select)				
(select)	(select)				
Total GEF Resources					

* No need to provide information for this table if it is a single focal area, single country and single GEF Agency project.

PART II: PROJECT JUSTIFICATION

A. STATE THE ISSUE, HOW THE PROJECT SEEKS TO ADDRESS IT, AND THE EXPECTED GLOBAL ENVIRONMENTAL BENEFITS TO BE DELIVERED:

Namibia is a sparsely populated country, with a land area of 824,269 km^2 and a population of only 1.8 million. It is a lower middle-income country with a GDP per capita close to USD 1,800. Namibia's total electricity consumption was 3,719 GWh[3] in 2008 of which about 50% was imported from South Africa, whose grid is 90% coal generated (much of it

[2] Include project preparation funds that were previously approved but exclude PPGs that are waiting for approval.
[3] From NamPower 2008 Annual Report (also found on: http://www.nampower.com.na/docs/2008%20Annual%20Report/3_Group%20Key%20Statistics%20&%20Transmission%20Map.pdf)

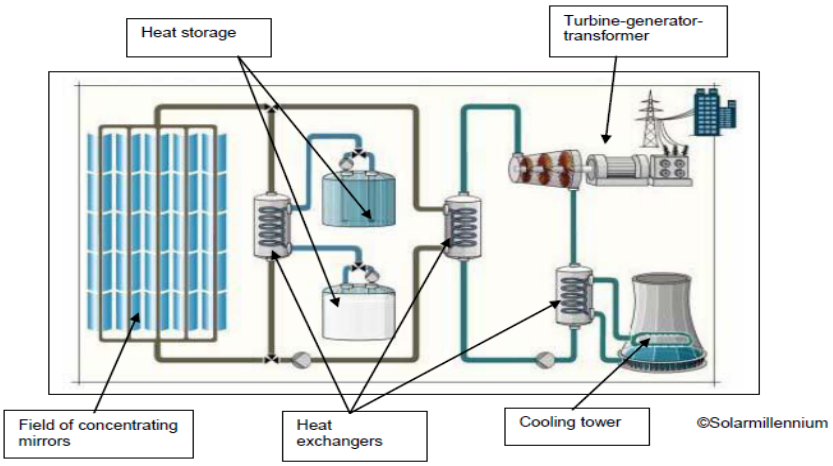
coming from the Hwange coal–fired powered station in Zimbabwe). Of Namibia's 393MW of in-country generating capacity, almost 36.6% is fossil fuel based. Average annual growth in electricity demand is estimated at 3% over the next 30 years. At the same time, the Namibian Government is pursuing a policy of energy security by promoting a diversified energy mix which will ensure that in the national economy does not become overly dependent on one source of energy[4]. With the projected growth in demand and given the Government's policy of seeking to achieve an energy mix that ensures energy security, it is clear that the country's electricity generating capacity needs to be enhanced with the focus on developing its own energy sources, including renewable energy, and solar energy in particular.

Namibia has one of the best solar regimes in the world with an average high direct insulation of 2200kWh /m²/year with minimal cloud cover. In recognition of this unique endowment, the Government has actively promoted the use of solar energy and uptake of solar energy has increased significantly as a result of Government efforts. This has been almost exclusively for off-grid applications. To more fully exploit its solar energy potential, Namibia is well placed for the development of grid-fed solar power-generated electricity, particularly considering the availability of vast areas of land with ideal conditions for large scale solar power electricity generation. Solar generated power fed into the grid will help Namibia reduce the carbon intensity of its current electricity supply and contribute to climate change mitigation efforts. Namibia has embarked on a process of moving progressively towards cost-reflective tariffs for various grid-fed energy generation regimes, which greatly improves the financial viability and investment potential of renewable energy schemes for electricity generation.

Concentrating solar power (CSP) is a commercially available solar energy technology that uses direct sunlight and mirrors to create high temperature steam to drive conventional steam turbines with or without storage. A typical CSP power plants (see Fig.1 below) is comprised of the following components; solar field (e.g. the Nevada Solar One – Fig 2), power block, thermal storage (optional), cooling tower and all other components found in any thermal power plant except the heat source. The leading CSP candidate technologies for utility-scale applications are parabolic troughs, parabolic dishes with Stirling engines, central receivers and the Linear Fresnel. In the last decade, several companies have emerged as leaders in the various CSP technologies. With respect to the trough systems, key players include Abengoa Solar (Spain), Acciona (Spain), FPL Energy (USA), Solar Millennium (Germany), Solel (Israel), and SkyFuel (USA). In Tower systems, the market players include Spanish company Abengoa Solar, and the US companies, Bright Source Energy, eSolar, and Solar Reserve.

There are several projects at various stages of development around the world to develop CSP power such as Andasol I –III in Spain (supported by the Royal Decree 436/2004[5]), Aachen University (Germany), Kuraymat (Egypt) and DESERTEC[6] (North Africa),

Figure 1-Typical CSP plant schematic diagram



[4] White Paper on Energy Policy of 1998 is clear on the need for diversification in the national energy mix.
[5] http://www.solarpaces.org/Library/Legislation/docs/040327RD436-2004.pdf
[6] http://www.desertec.org/en/foundation/

Figure 2- Nevada Solar One, USA.

Nevada Solar One ©Lahmeyer International

CSP for electricity generation has proven its feasibility as an energy source for the "post-fossil fuel" era. At present, a total of 354MWe of installed capacity is operating commercially in the Californian desert. At the same time, national and international investment in research, development, demonstration and dissemination continues to yield important technical improvements. CSP is one of the most innovative forms of solar technology which could meet a large portion of the world's demand for electricity. Developing countries are currently installing about 75,00MW of new capacity per and studies shown the technical market potential CSP to be more than 600,000MW over the next 20 years (Price & Carpenter, 1999[7]). At this scale CSP could therefore make a major contribution to the reduction of greenhouse gas (GHG) emissions. However due to the current costs of electricity produced by CSP plants of 0.08 – 0.12 Euro/KWe compared to the production from conventional sources, applications of CSP are currently limited to areas that provide the best solar radiation and investment framework. Moreover, sustainable energy production with CSP technology will only be viable if energy production and capital costs are reduced. Increased use of the technology through demonstrations and dissemination, coupled with research and technological development as well as appropriate financial incentives, is expected to play a key role in achieving the successful development of the industry. In terms of its commercial viability as a power generation option, CSP falls between wind power and photovoltaics (PV) in terms of $/kWh and represents a technology that is ready for scale-up in developing countries, since it has yet to benefit from cost savings that often come with manufacturing scale.

With this in mind, several Namibian stakeholders from both the private and public sector – supported by various partners, notably Germany – are currently involved in initial discussions and actions focused on promoting the development of the CSP technology in Namibia. These include:

- The Renewables Academy AG (RENAC), through the Transfer Renewable Energy & Efficiency (TREE)[8] project with financial support from the Germany Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, conducted CSP seminars in five (5) different countries, including Namibia, in the months of March and April 2009. Namibia's CSP Seminar, held between 23-25 March and coordinated by REEEI, drew participants from both industry and academia. Following the successful training workshop Rössing Uranium Limited (a Namibian Rio Tinto mining subsidiary) is presently exploring using CSP technology to generate process heat. Rössing has a research cooperation agreement with the Polytechnic of Namibia (PoN) and have indicated their desire to collaborate on this particular project.

[7] Price Henry & Carpenter Stephen. 1999. The Potential for Low-Cost Concentrating Solar Power Systems. NREL. Colarado.
[8] The TREE project promotes capacity building and know-how transfer for both decision makers from politics and business, as well as technicians and engineers. http://www.tree-project.de/course-program/course-details/course/16/

- REEEI through its parent organisation, PoN, has cooperation agreements with FH Aachen which hosts the Solar Institute Jülich (SIJ) and RENAC while research collaboration agreements with Fraunhofer Institute ISE and Lahmeyer International are being finalised.
- SUNTEC Namibia (Pty) Ltd, a local subsidiary of a German company, has confirmed their interest in providing a solar thermal power plant with 5 MW capacity, including the plant, installation and commissioning. In their proposed project 32 solar collector assemblies (SCA) will be installed with the efficient parabolic trough collectors used for collection of solar energy. A 6 MVA capacity steam turbine would be installed for the power generation from the solar heat collected from the solar collectors. The plant may use some sort of indirect thermal energy storage technique for storage but the exact specifications have not been finalized. In the case that auxiliary gas financing must be used as alternative or back-up option to provide backup capability during low and non-solar hours it will be financed separate from the GEF co-financing amount (the various options will be considered as part of the feasibility study). The solar power plant will be grid connected. If implemented, the project activity would be the first of its kind in the region and will use the latest state of the art, environmental friendly technology for power generation.

All the foreign organisations mentioned are from Germany and are active in CSP development; SIJ has built a 3MW CSP plant (commissioned in 2009), RENAC arranges and coordinates specialised training, Lahmeyer International have wide consulting experience in the field of CSP and Fraunhofer are system modelling and simulation specialists. REEEI and Fraunhofer have applied for additional funding from the EU under the following window: EU AID/128320/C/ACT/Multi-ENRTP Priority 5/Lot 11. In addition, renewable energy market-leading countries such as Spain, are exploring the possibility of tapping into the Namibian and Southern African markets based on their global expertise. In fact there is a strong possibility that German firms will resort to Spanish companies such as Abengoa Solar to set up the plant, as well as other established Spanish players in this sector. Institutionally, Spain is also reviewing its international cooperation agenda, which could also lead to support for capacity development initiatives and technical assistance for a more conducive framework for CSP investments (e.g. bilateral or multilateral agreements) in Namibia. Spain's presidency of the EU in 2010 could provide a major push for institutional support for the development or strengthening of such initiatives.

Building on these recent events and the interest expressed among local actors, Namibian stakeholders are now eager to take necessary steps to contribute to the development and implementation of locally-specific CSP technology policies and platforms by engaging in technology transfer and pre-commercial demonstration schemes. The funding available under the GEF-4 Resource Allocation Framework provides a key strategic entry point to achieve that goal.

While it is evident that all the appropriate climatic conditions for the deployment of CSP technology are available in Namibia, there are still several barriers that are inhibiting the establishment of CSP plants, including the ones outlined below:

a) Inadequate financial and regulatory frameworks**:** Investors in general have tended not to invest in large-scale renewable energy technology in developing countries, including Namibia, due to the lack of support mechanisms such as appropriate financial and regulatory frameworks. For clean energy projects, market access and financial viability requires that independent power producers (IPPs) must be able to sell electricity at an acceptable price either through equitable regulated purchase tariffs or more generally through power purchase agreements (PPAs) to a distribution company or distant consumer (wheeling). Unfortunately, in many developing countries purchase tariffs are non-existent, PPAs are poorly designed, and regulators do not allow the wheeling of excess power production through existing national grids. Key missing elements in the regulatory framework of the electricity sector also prevent many clean-energy projects from benefiting from carbon finance schemes. The regulatory framework and financial incentives required for investment in the renewable energy sector in Namibia is currently being addressed by MME, ECB and REEEI;
b) Limited technical and financial capacities: Despite expressing their willingness to participate in CSP technology diffusion, local investors (such as the mines and the development banks) often lack the technical and financial resources and expertise to develop and adopt the CSP technology. Lack of investment and financing capacity is a chronic barrier for any capital-intensive infrastructure project in Sub-Saharan Africa and this inhibits the ability of project developers to secure underlying financing for their projects. Due to their unfamiliarity with the technologies

involved, local financiers and developers often cannot design appropriate financing packages and risk instruments for the technology;

c) Lack of access to appropriate technologies: Development of clean-energy projects in countries of Sub-Saharan Africa requires the operation and use of modern technologies (usually not cutting-edge techniques) that are often not readily available. Such technology transfer requires selected capacity-development activities that depend on the clean-energy potentials targeted. These activities range from research and development to training and information dissemination, as well as the transfer of physical infrastructure. In the case of CSP technology, the technology is still largely unknown in many parts of the world and presently confined to a few countries and companies such as Abengoa (Spain), Flagsol, FlabegHold GmbH, Schott AG, (all Germany), Solel (Israel) and Archimede Solar Energy srl (Italy). This project will seek to address this barrier by introducing this technology to Namibia;
d) The local grid codes and guidelines, including standards, are not well-suited for renewable energy technologies; and
e) Limited awareness, promotion and participation on TT including inappropriate policy support: There is a general lack of awareness by policymakers on the potential role of renewable energies through TT in the energy mix of the country which inhibits the adoption of appropriate and relevant policies and regulations to increase the diffusion of these technologies.

Whilst recognizing that there are sufficient solar resources and a demonstrated need for additional generating capacity in Namibia, the objective of this approach is to promote deployment of locally appropriate CSP platforms so that through adaptive learning from a pre-commercial plant, many of the barriers stated above can be sufficiently addressed. During the first six months of the project implementation phase, various steps will need to be taken to ensure that there is a suitable framework in place that will allow the CSP project to be implemented successfully. These steps will include creating the basic enabling conditions necessary to catalyse private sector participation in the program in order to initiate a long-term self-sustaining CSP market development in the country. Namibia requires the preparation and formulation of an appropriate environment to facilitate TT, and thus the first components of the CSP TT project focus on codifying the necessary market, regulatory and institutional policies and partnerships to support the objectives of this project. Hence, the emphasis on developing the adequate policy framework and on financing or otherwise incentives for investment and technology transfer. The mobilization of technical assistance resources would support country dialogue, establishment of regulatory frameworks, the preparation of international cooperation agreements, and undertaking technical and economic analyses for inclusion of CSP projects in Namibia's generation expansion plans.

The project will be coordinated by REEEI, implemented by NamPower (because of its experience and resources in operating conventional power plants and its role as an off-take buyer of the generated electricity). Rössing Uranium Limited is expected to serve as the off-taker of waste heat; Renewables Academy AG as the provider of the technical training and overall capacity development; and Fraunhofer Institute ISE and/or Lahmeyer International as providers of technical expertise. The exact partnership structure and implementation arrangement of the plant installation will be decided based on the final choice of operator (whether SUNTEC Namibia (Pty) Ltd or another entity) and the investors involved.

The project will have 4 main components:

Component 1: Establishment of CSP Technology partnerships

CSP technology is still confined to a few players in the world in Germany, Israel, Italy, Spain, United States of America and other developed countries with active applied research. Under this component, the following outcomes are expected:

(1) Established technology partnerships between foreign technology providers and Namibian partners including private sector, academia and government; and

(2) Enhanced knowledge of applicable CSP applications in Namibia.

To realize this, the project will carry out a scoping and due diligence analysis of global players (using some of the networks created through the TREE project CSP Seminar), finalize and create a few additional partnerships through memoranda of understanding to facilitate technology transfer. Other activities will focus on building interest amongst local industries through their associations such as the Namibia Chamber of Commerce and Industry (NCCI), so that they are embedded in the project from onset.

Component 2: Market Policy Framework for CSP technology

This component will consist of activities that will contribute to the development of the following outcomes:

(1) Approved policies supportive of CSP technology applications; and
(2) A thriving CSP market in Namibia.
The activities will involve insuring that a policy framework is put in place to support and guide the deployment of CSP technology. Technical interconnection and guidelines for power purchase agreements will be developed.

Component 3: Business Model and Financing Framework for CSP projects

Activities in this component will help bring about the following outcomes:

(1) Financing institutions/banks providing loans to CSP projects; and,
(2) Increased number of CSP installations in the country.
The activities that will be carried out to deliver the outputs that will contribute to the realization of these outcomes include a detailed analysis of the technologies identified in Component 1 and the development of a concrete business case and financial model that will lay the foundation for the pre-commercial plant to be established. The business model will explore and define the appropriate technical, financial and economic parameters for the CSP plant.

Component 4: CSP Pre-commercial demonstration plant

The expected outcomes under this project component are basically related to the demonstration of an operating CSP facility. These include:

(1) Improved confidence of the government and citizenry on the techno-economic viability of CSP; and
(2) Several replications of the CSP plant.
The following activities, with estimate time periods, will be performed in this component of the project life cycle of the 5 MW CSP power plant;
Project Development (12-24 months)

- Authorisation, bankable solar resource developed,
- Basic design (feasibility study - parabolic trough, central tower and linear Fresnel are the 3 solar collector technologies to be examined; storage and non-storage options will also be considered), tendering (e.g. solar collector technologies identified from the feasibility study), contracts, special conditions agreed and signed. *Note*: The likely technology would be parabolic trough as it is well-proven in the global market (as well as the preferred choice of SUNTEC Namibia (Pty) Ltd), and thus would assist in securing partnerships with established service providers/contractors (trough configuration is the most widely used across the world, with the most currently operating and under construction plants, and having been commercialized since 1985)

Project Construction (24 months)

- Ground breaking, mobilisation, re-evaluation, detailed engineering, earthworks performed,
- Delivery of equipment, civil works, assembling of main equipment, pre-commissioning,
- Commissioning, functional tests start up.

Warrant Period (12 months)

- Trial runs and tuning of the plant.

Plant running (24 months)

- O&M information management is designed to integrate information communication technology for operation and maintenance. Plant operating strategy will be developed to deal with staffing, mirror breakages, storage options, reflectance and heat loss; as well as monitoring and recording of operating events such as power generation, water consumption; climate data etc. This will help analyze and calculate O&M and subsequent generation costs for larger commercial plants. It is expected that there will be a reduction in risk premium whilst lessons will be learnt on risk and environmental impact mitigation.
- The overall project outcome is a scenario of an emergence of local entrepreneurs and technologists capable of integrating the various technologies and experiences for large scale replication for power generation and process heat.

Extensive analysis of the plant's installation and operational features will provide local technocrats with knowledge and skills to design, operate, and maintain CSP plants in future with little foreign input except for critical points. In addition,

plant installation and operations will lead to direct (manufacturing, contracting, construction) and indirect (service) job-creation.

The application of CSP in Namibia will have global environmental benefits as well as development benefits for Namibia. These include:

- Avoided carbon dioxide emissions through substituting fossil fuel generated electricity with a 5MW CSP plant would be approximately **10,700t**[9] CO_2 equivalents per year, assuming a 25% load factor;
- CSP will provide a cost effective option for promoting energy security by increasing diversity in the primary energy mix, through increased market penetration of on-grid renewable energy as a proportion of total energy from renewable sources. Solar thermal power generation can integrate well with conventional power options, and is attractive to utility markets because of its scalability and storage potential;
- CSP is not location-specific and can be deployed as a decentralised power source anywhere in Namibia. Namibia being a vast and sparsely populated country providing power for development in remotely located areas of the country. This in itself will contribute to attainment of various MDGs targets, including ensuring environmental sustainability, reducing poverty and promoting education for all.
- International partnerships in a CSP pre-commercial plant will allow Namibian industry to become familiar with the technology and local capacity will be built paving the way for a future competitive CSP market. This will build on training workshops and symposiums on CSP technology held by REEEI and its partners such as Fraunhofer ISE and Lahmeyer International.
- CSP technology is modular and its components can largely be manufactured from conventional materials using well-known and proven technologies. This presents the potential for the technology to be absorbed and adapted by local industry leading to more effective technology transfer practices. Taking a two-step process whereby the initial project implementation phase will focus on setting and codifying the appropriate market, regulatory and set-up environment, will ensure that the technology to be transferred will be sustainable in the long-term, and not only end as a demonstration project. Despite past global experience, a significant take-off of this market is expected nationally and regionally, with the consequent reduction in GHG emissions. The proposed local project will have a far-reaching impact.
- On the other hand, Namibia has a relatively well-developed, vibrant and dynamic renewable energy private sector industry with potential for greater manufacturing and innovation. The Renewable Energy and Energy Efficiency Capacity Building (REEECAP) study funded by DANIDA on the Electricity Supply and Demand Management Options for Namibia[10] identified that a mix of electricity generation options including CSP would be the best strategy to avert the imminent power shortage and increase energy security in the country. This study, together with other REEECAP studies, also identified solar, biomass and wind energy development as the best low carbon energy options for Namibia.

B. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH NATIONAL / REGIONAL PRIORITIES/PLANS:

Namibia is committed to the development of its renewable energy resources as articulated in the White Energy Paper of 1998. The Government further recognizes the important role renewable energy and particularly solar energy can play in the primary energy mix and energy security. Indeed Namibia supported by catalytic resources from the GEF has put concrete measures in place to promote solar energy use. With GEF support, Namibia has made great strides by removing some of the previous technical and institutional and market barriers to successful adoption of RET in the country. However, new innovations and opportunities that develop still need to be supported, like opportunities for CSP TT. Within the regional context, the development of CSP will add much needed electricity generating capacity as well as facilitate the transfer of a technology with potential to benefit other countries in the region. Technology transfer is a key

[9] Ninety-two percent of South Africa's energy is generated from coal-fired power stations which emit approximately 1.07 tonnes of CO_2 per MWh (Report: Bulk Renewable Energy Independent Power Producers in South Africa, DME and DANCED, 2000). The emission reductions are calculated based on the assumption that the electricity to be generated by the CSP technology will displace the portion of fossil fuel-based electricity generated internally. Also note that a further reduction of the abatement cost may be possible if the load factor is increased; however, this would mean the cost of the plant will increase because of the need for additional storage.
[10] Electricity Supply and Demand Management Options for Namibia. A Technical and Economic Evaluation – a REEECAP study prepared by EMCON Consulting for REEEI (2008).

aspect of Vision 2030, Namibia's long-term development aspiration, which aims to develop the country into a knowledge-based fully industrialised country. At the same time, the current National Development Plan 3 (2007-12) has set a target for 10% of the national energy demand to be sourced from renewable energy by 2012.

The proposed CSP project built on various project interventions supported by Namibia's development partners, notably DANIDA, GTZ and GEF, particularly from the TNA undertaken under the SNC as well as various report under the NAMREP projects. In 2007, Namibia under the leadership of the Ministry of Environment and Tourism (MET) successfully enacted the Environmental Management Act which provides for compulsory Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA), including the establishment of a conducive enabling environment for appropriate technologies. The proposed project is relevant to the ongoing MET climate change programme, in particular to its efforts to develop a national mitigation plan and support the development of technologies that reduce GHG emissions, including renewable energy technologies (RETs).

C. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH GEF STRATEGIES AND STRATEGIC PROGRAMS:

The project which aims at mititaging the impacts of climate change through the promotion of on-grid renewable energy in developing countries, is an element of the GEF-4 Resource Allocation Framework. The project idea responds directly to the GEF aim to promote low-GHG energy technologies, through the increased production of renewable energy in electricity grids. In addition, the project will also support goals of GEF-supported adaptation activities in particular technology related aspects to meeting country needs in the area of climate change adaptation. The project will help Namibia to develop its capacity is CSP technology through a pre-commercial solar thermal plant, which is regarded as one of the cleaner and more mature technologies through south-south and north-south transfer opportunities. Namibia has ratified the UNFCCC on 16 May 1995 and met its obligation by completing Namibia's First National Communication (the INC) to the UNFCCC in 2002, and subsequent implementation of Namibia's Second National Communication, currently under preparation. Both the INC and SNC technical and research studies contributed to the GHG inventories and identified key vulnerability issues and priority policy measures for Namibia.

D. JUSTIFY THE TYPE OF FINANCING SUPPORT PROVIDED WITH THE GEF RESOURCES:

GEF resources will be used to procure the technical assistance required to draw from international experience and expertise to carefully address the critical barriers to the adoption of CSP development in Namibia; and, to design appropriate tools, instruments, local capacity and environment to galvanise a market-led approach to the transfer and deployment of CSP technology in Namibia. GEF resources will also result in the leveraging of financial and human resources from government, private sector and financial institutions, by supporting on a catalytic basis the removal of technical, financial and institutional-policy barriers. This will create the conducive enabling environment required for the deployment of CSP, and lay the foundations for the commercial application of CSP for power generation. The GEF resources will be utilised by following a two- stage approach which supports the creation of an enabling environment as a first step, followed by supporting the running of the CSP demonstration plant. In this regard, the combination of technical assistance with significant private sector co-financing provides an ideal opportunity to jump-start both the national and regional CSP market. With GEF support, the adoption rate of this technology would be substantially accelerated.

E. OUTLINE THE COORDINATION WITH OTHER RELATED INITIATIVES:

In the White Paper on Energy Policy (1998), the Government of Namibia recognises the importance of renewable energy in the country's energy mix. Further the Government has put in place concrete measures to promote the greater use of solar energy and has successfully managed a large scale GEF supported project that aimed at removing barriers to adoption and promotion of RETs and solar energy technologies (SETs). In particular, this component will support the country's Off-Grid Energization Master Plan which has mobilized financing for the use of primarily solar energy in extending electricity services to off-grid areas. In addition, both the Country Programme Document (CPD) and Country Programme Action Plan (CPAP) 2006-2010 of the Government of Namibia and UNDP identify energy and environment for sustainable development as a key strategic point to support Namibia's long-term development aspirations. The TT project idea is based on the CPD as well as the current UNDP strategic business plans 2008-2011 and directly contributes to the attainment of the Millennium Development Goals (MDGs). The outcomes are linked with the UN Development Assistance Framework (UNDAF) for Namibia 2006-2010, particularly Outcome 4.4: which address capacity development and enhancement to deal with challenging sector environments. Namibia has recently completed an innovative project on cleaner production programme in conjunction with UNIDO.

MME is presently formulating the New Energy Regulatory Framework (NERF) which will look at governing the approach of renewable energy and energy efficiency market development in Namibia by facilitating fair market access, return on investment, quality of supply, standards, market support structures and incentives and legal issues in Namibia. NAM CSP TT will provide valuable input to NERF and at the same benefit from a successful energy regulatory framework. NAM CSP TT will benefit from the fact that both executing partners, MME and REEEI, have collaborated in executing REEECAP and are still working together to coordinate both NERF and the Off-Grid Energisation Master Plan (OGEMP).

This project also builds on the latest efforts of the World Bank Group to pursue a Concentrated Solar Power (CSP) scale-up in the Middle East and North Africa (MENA) as part of their Clean Technology Trust Fund. The WB concept note is for a regional investment plan to implement a Gigawatt-scale CSP program in the MENA region that will accelerate the global adoption of CSP technology. They note in the concept paper that a confluence of factors provides a unique opportunity to provide scaled-up financing for the demonstration, deployment and transfer of a low-carbon technology such as CSP with significant potential for long-term greenhouse gas emissions savings.

F. DISCUSS THE VALUE-ADDED OF GEF INVOLVEMENT IN THE PROJECT DEMONSTRATED THROUGH INCREMENTAL REASONING:

Although CSP technology is being applied commercially elsewhere, it is still more expensive than conventional generation technologies. High initial capital costs are still a significant barrier for adoption of this technology. Estimates range the capital costs between $4000 and $6000 per kW for a typical capacity factor of 22-24 %. It is a major challenge for a developing country such as Namibia to justify the allocation of its scarce capital resources to this technology without GEF catalytic co-financing support to address the identified barriers and implement the proposed project. Namibia has amongst the world's best production conditions for solar power: abundant sunshine, low precipitation and plenty of unused land.

GEF resources are necessary to encourage and build confidence for private sector participation through learning by doing and the leveraging of non-grant resources (including local sources of project finance and capital investment) for CSP technology transfer. These catalytic resources would encourage additional resource mobilization to provide the critical mass of investments necessary to attract significant private sector interest, development agencies, financial institutions and other donors; benefit from unexploited economies of scale to reduce cost; and result in organizational learning in stable operating conditions.

It has been shown that once the first CSP plant is put in place, it is likely to serve as a demonstration project which will provide valuable information to both regulators and policy makers through field tested facts that will guide renewable energy regulatory and policy frameworks. This would contribute to the scale-up of renewable energy as part of Namibia's energy development and security strategies. Above all the project will promote more awareness and create more local business opportunities for component manufacturers and suppliers. The project has thus the appropriate scope and level of ambition to directly reduce the barriers for the installation of subsequent plants. GEF resources will thus serve to catalyse accelerated sustainable development of the energy sector in Namibia, thereby providing the stimulus necessary for replication nationwide and regionally. GEF will be supporting a key area which is to be part of the future climate change mitigation option that is to serve as a pilot multilateral agency on technology transfers.

G. INDICATE RISKS, INCLUDING CLIMATE CHANGE RISKS, THAT MIGHT PREVENT THE PROJECT OBJECTIVE(S) FROM BEING ACHIEVED, AND IF POSSIBLE INCLUDING RISK MEASURES THAT WILL BE TAKEN:

Risk	Rating	Mitigation Measure
Introduction of new electricity generation capacity in Namibia and associated re-prioritisation of national power generation programmes may require additional fiscal transfers or higher consumer tariffs compared to fossil fuel alternatives	High	New electricity generation capacity may substantially influence future electricity prices in Namibia. However, it is anticipated that future electricity tariffs based on fossil fuels will be substantially higher than at present, which will automatically promote renewable energy technologies.
Failure to get cooperation with and	Medium	This will be mitigated by putting in place an effective

between all relevant government ministries and institutions for the design of policy and regulatory measures for the promotion technology transfer and renewable energy		stakeholder consultation and engagement plan, which is inclusive and skilfully implemented.
Failure to develop appropriate arrangements and financial incentives to attract national and international private investments, including the closure of financing and demonstration of viability for the 5 MW demo plant	Medium	This will be mitigated by ensuring that the private sector is involved in the identification of barriers, risks and constraints, as well as the design of measures and instruments to facilitate private sector participation. Commercial viability will be a leading criterion for insuring private sector engagement.
Inflationary pressures, including the global economic downturn, have had a considerable impact on the growth of the Namibian economy in the past	Medium	Although the medium-term outlook is looking more optimistic, inflation and economic downturn may impact the delivery of the project by reducing consumption and demand, thereby reducing the incentive to seek investments for new power plants. It is recommended that the technical-economic studies make specific reference to how to limit the impact of inflation and economic crises on the deployment of large-scale CSP technologies.
Failure to secure support for the development of technology partnerships between technology owners and relevant local entities	Medium	This will be partly mitigated by tapping on the expertise and network of UNDP and its specialised sister agencies. The project will also seek the involvement of all key players from the outset.

H. DESCRIBE, IF POSSIBLE, THE EXPECTED COST-EFFECTIVENESS OF THE PROJECT:

The GEF Alternative Scenario would result in a rapid increase in renewable electricity, especially CSP technology based, by qualified Namibian developers with financial support from local institutions. The learning-by-doing approach to be adopted by this project will create confidence amongst the local players so that future CSP technology deployment will have a larger local component, thus increasing the cost effectiveness of the technology.

CSP is of particular interest to utilities because it is lower cost and more scalable than, for instance, photovoltaic technologies. Thus, the critical involvement of NamPower reduces the uncertainties over power purchase agreement policies, or adequacy of transmission infrastructure. Namely, the proposed plant location, where a turbine generator with a capacity of approximately 24 MVA will be connected to an existing substation with the same adequate voltage level close to the solar plant site, will significantly reduce costs. Meanwhile, the comparatively reduced land footprint of the parabolic trough (land required by CSP plants per MW of installed capacity), versus other CSP technologies (e.g. tower, dish-engine), as well as the shorter lead time of implementation (with SUNTEC interested in building and making the plant operational immediately) will translate into significant cost reductions (Levelized Cost of Energy).

NAM CSP TT is projected to tentatively realize:

- Direct emission reductions of **10,700t CO_2** per year, resulting from the investment in a 5MW CSP demonstration plant leading to substitution of an estimated 10 GWh per year of fossil fuel based electricity (depending on load factor and storage capacity). Considering a 15 year plant life, the total direct CO2 emission reduction is about 160, 500 tons.
- The estimated unit abatement cost considering the US$ 1.7 million GEF contribution to this project is about US$ 16.1/ton CO2. This however can be improved when factoring in indirect post project CO2 emissions from replications put in operation during and/or after this proposed technology transfer project as a result of the demonstration phase.

I. JUSTIFY THE COMPARATIVE ADVANTAGE OF GEF AGENCY:

The project involves climate change capacity building and technology transfer intervention on grid-tied photovoltaic systems, which falls under UNDP's comparative advantages as presented in Annex L of the document GEF/C.31/5 rev.1. In addition, UNDP is the leading international agency working on climate change related issues in Namibia, with ongoing programs to assist the Government of Namibia in removing barriers to the use of renewable energy and the promotion of energy efficiency through GEF funded projects, such as the Barrier Removal to Namibia Renewable Energy Programme (NAMREP) and the Namibia Energy Efficiency Programme (NEEP). These initiatives are contributing to the drive on energy access to the poor and energy-efficient development in the country's policy agenda. UNDP has also assisted the Government of Namibia in developing enabling policies to promote renewable energy such as OGEMP and the Solar Water Heater Cabinet Directive requiring the use of solar water heaters in government institutions. Furthermore UNDP has assisted the Government of Namibia in preparing its Second National Communication to the UNFCCC. The proposed CSP TT project is expected to add the technology transfer dimension to UNDP's ongoing capacity development policy advocacy, for a comprehensive adoption of climate change mitigation in Namibia. Considering its strong replication potential, as well as the project's commercial focus, this initiative will help develop and transform the national market for renewable energy, so that Namibia's long-term growth follows a less carbon-intensive path. The ongoing strong engagement with the MME and REEEI will support the mobilization of additional public and private sector financing on the scale required the project's transformational objectives.

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 country endorsement letter(s) or regional endorsement letter(s) with this template).

NAME	POSITION	MINISTRY	DATE *(Month, day, year)*
Mr. Teofilus Nghitila	Director: Environmental Affairs	Environment and Tourism	August 07, 2009

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies and procedures and meets the GEF criteria for project identification and preparation.

Agency Coordinator, Agency name	Signature	Date	Project Contact Person	Telephone	Email Address
Yannick Glemarec UNDP/GEF Executive Coordinator	Y. Glemarec	April 28, 2010	Lucas Black, UNDP-GEF Regional Technical Adviser (acting) Climate Change Mitigation	+1 212-906 6230	lucas.black@undp.org