JOINT PROGRAMME/PROJECT DOCUMENT

OF THE UN FUND FOR RECOVERY RECONSTRUCTION AND DEVELOPMENT IN DARFUR

Darfur Solar Electrification Project

Khartoum, February 2016

UNDP, UNIDO, UNHABITAT, WHO, DRA, MWRE, NERC

DDS Pillar: II	Reconstruction
Programme title:	Darfur Solar Electrification
DDS Objectives Programme outcome:	Objective 3: Increased access to electricity services

Lead Agency	UNDP
Participating Agencies	UNIDO, UNHABITAT, WHO, DRA, MWRE, NERC

Programme Duration:	18 Months
Anticipated start/end dates:	December 2015
Total estimated budget*:	USD 5,638,900

Names and signatures of (sub) national counterparts and participating UN organisations

UN organisations	National Coordinating Authorities
Signature Selva Ramachandran UNDP Date & Seal	Signature Dr Al Tijani Seissi Chairman, Darfur Regional Authority (DRA) Date & Seal
Signature UNIDO Date & Seal	Signature Undersecretary, Ministry of Water Resources and Electricity Date & Seal
Signature UNHABITAT Date& Seal	Signature Director General, National Energy Research Centre-Ministry of Science of Communication Date & Seal
Signature WHO Date& Seal	

Promoting Access to Clean Energy Services in Darfur Region

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1. Executive Summary

The Darfur Solar Electrification Project (hereinafter called "the Project") is grounded in the outcome of the Doha Document for Peace in Darfur (DDPD) signed in 2011 between the Government of Sudan and the Darfur Regional Authority (DRA), which built the foundation for strengthens the peace and development processes. The needs and priorities identified by the project for solar systems is based on the results of the Darfur Joint Assessment Mission (DJAM) taken place in 2012 that determined needs and priorities of communities for the recovery and reconstruction. The DJAM, suggested that UNDP formulates a project on "Promoting Access to Clean Energy Services in Darfur Region" in consultation with the development partners including government agencies and private sector. This project will also creating a hub for sharing and exchanging information, experiences, capabilities and resources between all stakeholders creating a favourable market up-take environment for the provision of energy services to the different segments of communities and different economic sectors.

The main output of the project is to install Solar Photovoltaic (SPV) systems in different community services centres (provide "*solar systems for schools, health clinics, streets, police stations, women centres and water pumping*) for 70 villages in Darfur. The project contributed to the achievement of pillar II of the Developing Darfur: A Recovery and Reconstruction Strategy (DDS). The project is implemented as a joint programming between UN agencies (UNDP, UNIDO, WHO and UNHABITAT), two government institutions (MWRE and NERC) and the Darfur Regional Authority (DRA). A series of consultative meetings were held with all those partners to ensure their agreements on the project objectives, planned outcomes, detailed activities and implementation arrangements.

The project provides direct benefits to 7,000 returnee's households who are settled in the selected villages. Besides, the project will indirectly benefits about 20,000 - 35,000 returnee households in the satellite villages (3 to 5 satellite villages surrounding each centre village where solar systems will be installed) which share the some services such as education and health services. According to the demographic data, the direct and indirect beneficiary of population are about 35,000 and 150,000 respectively.

The project has four main outputs:

A. Different solar systems procured and installed in 70 villages (7,000 households) including community services such as schools, health clinics, streets, police stations, women centres and others: The project is planning to install 8,120 solar systems of different types and sizes which can be grouped into 5 categories including DC systems (suitable for lighting systems for schools mosques and small service centres), AC systems (suitable for running computers, fridges, communication and satellite TVs), Street lights, mobile solar lamps, and solar pumps.

B. Technical assistance provided to ensure that installed solar systems are operated and maintained by the users: This is to ensure that PV lighting operate and maintain properly by the users. All the solar project installations will be accompanied by community training and solar PV curriculum will be developed for the vocational training centres.

C. Enabling environment created and scaled-up plan implemented through establishment of financing and dissemination mechanism: The enabling environment activities will initiate strategic collaboration and coordination of energy uptake with partnership of government, UN, civil society and academia. Sustainable financing mechanism will establish in collaboration with microfinance institutions and provide technical assistance for setting up the procedures and standards for the mechanism. The coordination mechanism will mobilize other financial and technical resources for example MWRE to include Darfur States in their solar rural electrification programme beside mobilizing NGOs, private sector and government institutions to invest in the provision of energy services in Darfur states.

D. Awareness for the renewable energy potential raised and Renewable Energy ATLAS for Darfur region developed and implemented: The activities comprise renewable energy researches, developed the renewable energy ATLAS for Darfur Regional and disseminated the renewable energy information through its project website.

The sustainability measures is planned to be taken during implementation include the trained workforce in the field of solar energy mini-grid installation, operation and maintenance. The project will depends on the activities of the vocational training centres in the region to introduce the solar systems and other renewable energy components in their curriculum. The project will also support the creation of market environment through setting up of conducive policies and financial mechanisms to scale up the use of solar and other renewable energy sources in the Darfur States.

The project's aims through implementation of all these activities are to initiate a sustainable process for scaling up the uptake of energy and improve the delivery of renewable energy services to upgrade the social services in Darfur.

2. Situation Analysis

Sudan's primary energy supply is estimated as 14.8 million tons of oil equivalent (toe) of which biomass resources accounting for 62%, fossil fuels 34% and electricity 4% of total energy supply. However, Sudan achieved improvements in the energy supply situation during the last 10 years due to the use of indigenous oil reserves and dams construction along the Nile, the South Sudan cession present a huge setbacks in the energy supply situation in Sudan. Following the secession of South Sudan in July 2011, Sudan has lost 60% of its biomass energy resources, 75% of its oil reserves and 25% of its hydro-power potential. This new development poses critical energy supply situation of all primary sources due to dwindling stock of energy resources from one side and increased population from the other side.

According to the Energy Situation Analysis Report, about 70% of the population currently has no access to electricity and about 92% of the population use biomass for cooking purposes. As an LDC (ranked 166 out of 187 countries on the Human Development Index, 2014) and with 46.5% of its population officially living in poverty (and many more near the poverty line), Sudan population are extremely vulnerable to energy supply constraints. In particular the population living in rural and remote areas will receive much of the negative impacts of insufficient energy supply situation. Besides, even this low use of modern energy it shows also wide disparities in distribution and use of modern services between the different States. The National Energy Assessment of Sudan (MEM 2001) reported that about 73% of the total electrical power is consumed in three states (Khartoum 45%, Geziera 18% and White Nile 10%), 16% is consumed by four states (4% for each of Sinar, Red Sea, Kassala, Nile States) and the rest 11% is consumed by 12 states (> 1% for each of Northern State, Blue Nile State, Kordofan States and Darfur States). Oil products also follow the same state disparities; five Sates consumes 83.4% of the total oil products (Khartoum 61%, Geziera 6%, Red Sea 5.4%, North Kordofan 5.4% and white Nile 5%) and the rest 13 States share the remaining 16.7% (less than 2% for each).

As from the above analysis, Darfur States are among the poor states in term of consumption of modern energy sources (electricity and oil fuels) where the security situation, distances from the centre and poor transportation facilities results in modern energy service unavailable and/or unaffordable to the majority of the states' population. The UNEP report *(The Use of Liquified Petroleum in Sudan 2010*) shows that of the main reason deterred people in El Fashir city from using LPG comes first the high cost of appliances, unavailability and high cost of refilling LPG cylinder. At the time of the report the price of refilling LPG cylinder (12,5 kg) is SDG 35 in El Fashir compared to SDG 12 in Khartoum.

Access to electricity services in Darfur States is limited and delivered through thermal power plants located in El Fashir, Nyala, Ed Da'ein, Geneina, and in Zalingei serving a local grid in each of these cities. According to the National Electricity Corporation (NEC), the total number of electricity-connected points in the Darfur region was estimated at 9,680 (about 1.1% of NEC consumers) in 2005. In 2012, the total number of connected points jumped to nearly 50,405. While this is impressive and demonstrates clearly the demand for such services, the cost to users and for generation by suppliers is not sustainable. There are four diesel/gas oil fired power systems in Darfur, which carry a total installed capacity of 41.5 megawatt (MW). In the last few years the Government, through the Ministry of Water Resources and Electricity, has implemented rural electrification programs, with some reaching very rural locations such as Eid Alforsan. The Boram power plant in South Darfur - a 2 MW generating capacity - has also received a complete maintenance overhaul. However, capacity problems, such as generator-overheating and fuel supply shortages, force these power stations to apply load-shedding

practices to balance the distribution of the daily electricity supply to Localities between the hours of 5:00 pm to 2:00 am. Power rationing is consequently inevitable.

The maximum generating capacity is currently insufficient to exceed six hours per day in Darfur. Correspondingly, the environmental effects of gas or fuel-powered generators, such as noise pollution and health-related concerns to people who work in the plants, are economic costs that should not be ignored. In the short term, diesel-based power generation options present immediate opportunities for lighting the main urban centres and meeting urgent electrical needs. However, it is essential to identify and clarify the existence of alternatives to diesel early in the process, because diesel requires large subsidies (in terms of fuel procurement) to make electricity affordable within the few townships that are serviced.

Solar energy, averaging 6.1 kWh/m^2, is particularly significant in Sudan, and is considered one of the best solar resources globally. Moreover, it is well distributed throughout the country, and high potential in the Darfur Region, facilitating the provision of energy services to rural settlements that are unlikely to be reached by modern energy infrastructure (electric grid and pipelines) in the foreseeable future. This renewable energy potential is increasingly recognized by the Government: the Comprehensive Renewable Energy Master Plan (2005) has as its specific objectives an increase in the share of renewables in Sudan's energy balance and increased access to renewable electricity services in rural areas, and the role of solar (PV) technology in achieving this is given great prominence. The particular role that solar energy can play in lighting is also receiving considerable attention: a 2011 assessment of national GHG mitigation options by the Higher Council for Environment and Natural Resources specifically identifies PV for rural electrification as one of six priority PV applications.

Access to energy is a critical enabler for economic and social development. Once communities have access to modern energy services, the impact on human development is significant: from cleaner indoor air and improved health to more in come generating opportunities and more time for other pursuits. Because of the gendered nature of energy poverty, access to modern sustainable energy can also significantly enhance the empowerment of women by reducing their time and labour burdens, improving their health, and providing them with opportunities for enterprise and capacity building. As well as reducing the security risk for women connected to the collection of firewood in areas affected by conflict and insecurity. Access to clean, affordable, sustainable energy is thus an enabling factor for economic development and poverty reduction as well as for achievement of internationally agreed development goals, including ensuring environmental sustainability and promoting gender equality. At the same time, access to energy services can be argued to be a human right in itself.

Energy policies and programmes that recognize women's work and roles in the energy sector and build on their expertise and influence within households and communities can be effective in promoting access to sustainable energy solutions for all (ENERGIA, 2007). Furthermore, it has been shown that taking women's needs into account as a key variable in energy interventions makes it more likely that energy will have a significant impact on households and community poverty and on gender equality. Thus, where energy interventions address women's equal participation, the potential for benefits is much higher.

Provision of lighting extends the working day and thereby the time available for engaging in income generating activities for women who often face substantial time constraints due to domestic work obligations. Access to energy based technologies enhances labour productivity and increases the time available for engaging in productive activities outside the household. However, due to social and legal restrictions on women's rights, including rights to own land, borrow money and make their own economic decision, women are often ineligible for financing for new equipment that can improve the productivity of their labour (ENERGIA, 2011). There is therefore a need to develop targeted training programme for women on the energy sector and to improve women's access to microcredit and loans.

3. Project strategies, including lessons learned and the proposed joint programme

3.1 Target Population

The population of Darfur region is approximately 8.7 million (CBS population projection 2014). Using the same ratios of the population census 2008, the following table provides estimate of population in Darfur region distributed by States and sex.

Table 1: Population estimates distributed by States and sex

States	Population	Male	Female
Northern Darfur	2,050,100	1,039,135	1,010,965
South Darfur	3,378,010	1,764,162	1,613,848
East Darfur	1,627,203	873,843	753,359
Western Darfur	922,779	451,705	471,075
Central Darfur	676,779	330,706	346,074
Total	8,654,871	4,459,550	4,195,321

Source: CBS population projection 2014

The region has been plagued with long conflict and civil unrest since 2003. The prominent result of this long unrest in the region is large number if displaced people inside and outside the country. The internally displaced population is estimated as 1.7 million settled in 338 locations in Darfur region and 280,000 refugees in 12 camps in Chad. In 2011, the Doha Document for Peace in Darfur (DDPD) was signed between the government of Sudan and Darfur Regional Authority. One of the main pillars of the Darfur Development Strategy (DDS) is the reconstruction of livelihoods to allow the economic development and improve access to social services in returns areas to support the return and reintegration and stabilization of the rural population in Darfur.

The primary focus is to establish demonstration plots in the public service area – streets, hospitals, municipal offices, women centres, community centres, police stations and schools – to access the affordable energy through PV lighting. The project will be implemented in 70 villages providing electricity for different social services. Each village is focal area serving 3 to 5 satellite villages settlements. Thus about 7,000 households will directly benefits from the project and additionally 20,000 to 35,000 households from the satellite villages will indirectly benefits from the project of which about 45% are female-headed households[1]. The special energy needs of women and other vulnerable groups are considered in the project through:

a) Inclusion of all groups in the participatory consultation process to assess their needs for energy services.

b) Equipping the women development centres, providing mobiles lamps to the elders and disabled persons.

c) The provision of sustainable electric power supply to the health facilities; the lack of continuous and sustainable electricity in the vast majority of rural health facility severely impacts the delivery of essential, life-saving interventions such as emergency surgery, deliveries, and vaccination of children. The lack of reliable power supply is one of the major causes most of the rural hospitals function at the level of primary health centre, providing only very basic services.

3.2 Project Background/context:

The Doha Document for Peace in Darfur (DDPD) signed in 2011 between the Government of Sudan and The Darfur Regional Authority (DRA) built the foundation for strengthens the peace and development processes. The DDPD was shortly followed by the Darfur Joint Assessment Mission

[1] The 45% of female-headed households is based on estimation provided by the DDS document.

(DJAM) in 2012 which determined needs and priorities of communities for the recovery and reconstruction of their region. The main output of the DJAM was the formulation of the Darfur Development Strategy (DDS) which offers a sequenced, coordinated and holistic plan for equitable, sustainable and participatory development for Darfur. The DDS was support commitments by all parties in the International Donor Conference for Reconstruction and Development in Darfur in Doha on 7-8 April 2013.

According to the Darfur Development Strategy, the local people will have access to clean, reliable and affordable energy during the FAST track activities. As a result, the UNDP formulates the project on "Promoting Access to Clean Energy Services in Darfur Region" in consultation with the development partners including government agencies and private sector. The project activities comprise a transparent energy data system and carry out the solar energy activities in the Darfur States. The basis for this energy data system is creating a network among the development partners for communicating their plans, projects and activities in the Darfur Region. This energy data system allow the sharing of information, experiences, capabilities and resources between all stakeholders creating a favourable environment for the market up-take in the provision of energy services to the different segments of the Darfur communities and different economic sectors. To meet the needs of this long-term strategy the coordination mechanism identifies the needs for the following information to be posted in the created energy data system:

- **a)** Communities' development needs and aspiration supported by gender sensitive assessment studies and evaluations;
- **b)** The private sector information including private energy companies' profiles, type of energy technologies promoted costs of technologies, marketing strategies and problems; and,
- **c)** The state and federal government supportive policies and created opportunities (taxes, duties, tariff, laws, policies etc.), plans, projects and activities

To support the realisation of the project objectives four activities will be implemented as follows:

- **a)** Demonstrate a functional solar systems by installing and running solar powered standalone PV stems in social services for 70 villages.
- **b)** Train workforce in the field of solar energy installation, operation and maintenance
- **c)** Create the market environment through coordination and support the setting up of conducive policies and financial mechanisms activities
- **d)** Conduct renewable energy researches, developed the renewable energy ATLAS for Darfur Region and disseminated the renewable energy information through its project website

In total the project will install more than 8,120 different standalone PV systems in different social services. In order to support the creation of market environment for solar systems in Darfur the provision and installation of these systems will be carried out through tendering to private sector. Experiences of business models for renewable in the neighbouring countries will be adapted to fit in the Darfur context. The project will directly support the installation of solar systems in the social services. For Solar Home System (SHS) the project provides linkages with microfinance to facilitate the purchase of solar home system by individual households.

3.3 Lessons Learned

There are several solar rural electrification projects implemented in the Darfur region. The last of which is Presidential Initiative in 2011 implemented by the National Energy Research Centre (NERC) in the border villages between Sudan and Chad. In this initiative, 30 villages were equipped with different solar systems: 15 villages on the Chadian side and 15 villages on the North Darfur side.[2] The following Table 2 summarises the service centres equipped with solar systems in each village.

[2] Kalbas, Sileya, Habiela, Bieda, FurBaranga, Tandalti, Asanga, Jabal Moun, Manjoura, Tandusa, Injakouti, Trangah, Um Dukhun, Um Garadil and Gamaga El Garbiya

Table 2: Types of solar systems installed by the Presidential Initiative in each village

#	Systems installed	Type of services provided
1	School (evening classes + computer)	Lighting + computers
2	Mosques	Lighting + Loud speaker
3	Police station	Lighting + communication system
4	Health Centres and Hospital	Lighting + Basic medical tools + vaccine fridges
5	Youth Club	Satellite TV + lighting
6	Street lighting system	10 street poles
7	Women development	satellite TV + lighting
8	Solar water pumps	Water pumping
9	Mobile Lantern lamp	Lighting

Source: The National Energy Research Centre (NERC) report 2011.

Besides this Initiative, many international organisations, such as UNICEF, UNHABITAT, WHO and many NGOs such as the Norwegian Church Aid (NCA), have installed solar pumps in villages in the Darfur region.

Based on these previous experiences, the different types and number of solar systems to be installed have been determined. The following Table 3 presents the classification of system type, initially planned to be installed in selected pilot areas in the five states of Darfur.

Table 3: Systems to be installed in each State

State	# of Vill-ages	Estimated direct beneficiaries		Types and number of solar system to be installed							
		Male	Female	Schools	Health Centres [3]	Police Stations	Women Develop-ment centres	PV Lantern for HHs	Street lights (Poles)	Solar pumps	Total number of systems
North Darfur	14	3,150	3,850	28	14	14	14	1,400	140	14	1,624
South Darfur	14	3,150	3,850	28	14	14	14	1,400	140	14	1,624
East Darfur	14	3,150	3,850	28	14	14	14	1,400	140	14	1,624
West Darfur	14	3,150	3,850	28	14	14	14	1,400	140	14	1,624
Central Darfur	14	3,150	3,850	28	14	14	14	1,400	140	14	1,624
Total	70	15,750	19,250	140	70	70	70	7,000	700	70	8,120

The experiences gained and lesson learnt from these PV activities shows that solar energy technologies improve life of the rural communities in many ways. The village solar energy projects directly benefited large number of population in areas where it was implemented. An assessment held by NERC in earlier solar projects showed that there are notable improvements of services as a result of the solar energy.

[3] Information on health centres is provided by WHO and the number allocated to each state is determined by accessibility (Good road & Secure) and synergy with health facilities' revitalisation projects

However, experiences from the above mentioned project identified some weaknesses, constraints and risks, which have to be dealt with so as to minimise their negative consequences on sustainable project implementation. These include:

- ***Local market for solar energy equipment and services are not functioning well:*** Lack of spare parts in nearby city market such as batteries, regulator, invertors, DC lambs and other parts which needs to be replaced after sometimes of use reduces continuity of services from these installations. In some cases it took a long time to get spare parts.
- ***Weak local capacity****:* there is also a lack of local capacity to do the installation, operation and maintenance. It adds to the time needed to provide after sale services and unavailability of trained persons in the surrounding to carry out maintenance services.
- ***System safety*** is also one of the concerns in the area where some system have been stolen in many areas. This is because system have high value and easy to dismantle and carry.
- ***Difficulty in the transportation*** of the system to the site which delayed the project implementation from 6 months to 11 months.

Some of the recommendations that can be put forward to tackle these constraints and risks can be summarised as follows:

- ***Encourage local private sector*** through tendering for the provision of project's solar systems installation
- ***Capacity building*** to develop sufficient technical capacity in the region so that after sale services can easily be obtained to secure the long life of the system and ensure continuous supply of services.
- ***Protection and safety*** should be considered in site selection. Having the Darfur contexts, safety is one of the major components in the selection criteria to ensure safe transportation of equipment to the site and after the installation.

3.4 The proposed joint programme

The proposed project is based on the outcomes of the Doha Document for Peace in Darfur (DDPD), which culminated in the Developing Darfur: A Rehabilitation and Development Strategy (DSS). By its nature the project aims to contribute to the achievements of DDS objectives. The DDS was developed through extensive consultations with the people of Darfur (IDPs, residents and pastoral groups), with contributions from several UN agencies (*inter alia:* UNDP, UNIDO, WHO and UNHABITAT), the Federal and five State government institutions and other international organisations. Each of these organisations has previous and ongoing activities in Darfur in at least one of the five Darfur States. Besides the national institutions such as DRA, MWRE and NERC are also implementing energy activities in these states.

The geographical presence of these UN and national institutions, the common reference for their activities (the DDS) and overlapping of mandates and responsibilities in the region provide common ground for joint programming and necessitates the creation of linkages between them for efficient and effective delivery of development services for the people in Darfur region. Each of these (UN agencies & partners) has a comparative advantage in some components of the project, which support the implementation of the project in many ways, summarised as follows:

- The role of the **DRA** as stated in the DDPD is "to enhance the implementation, coordination and promotion of all post-conflict reconstruction and development projects and activities in Darfur, and be responsible for cooperation and coordination among the States of Darfur". As a comparative advantage of the DRA, the DRA will be taking a lead role in the site selection and allocation of solar systems in the different service centres.
- UNIDO has a track record in strengthening the vocational training system in Sudan, and it is envisaged that the organisation will in the future, under the UNDF initiative, build and support vocational training programmes in the Darfur region. These vocational training centres will be used by the project to build the capacity on solar systems installation, operation and maintenance services. Besides these training centres provide the opportunity for the formation

of nuclei for solar business and small scale enterprises to support the development of solar market in the region. UNIDO activities in the project include:

- Assess existing training capacities and training needs per target group.
- Develop a tailored PV solar curriculum for vocational training courses in cooperation with vocational training centres.
- Identify and select potential instructors to deliver PV courses.
- Conduct training of instructors from the vocational training centres in the solar energy technologies' installation operation and maintenance works.
- Select 100 trainees, male and female, from the region to be trained in solar systems' technologies.
- Develop, print and distribute training material for the graduated students.
- Monitor and support the delivery of PV training courses, and issue certificates to successful graduates.

- **WHO**, together with **UN Habitat**, is working to strengthen health care service delivery through the physical and functional rehabilitation of 20 health centres in the five Darfur States. An additional five health facilities will be supported through a second health intervention implemented by WHO, UNFPA and UNICEF. The plan includes the supply of solar systems to power the health services technologies, but it has been found that the funds available are insufficient and complementary support is required. Thus, WHO/UNHABITAT and the health sector in general will benefit from this project in:
  - Determining the required technologies, sizing and installation;
  - Provision and installation of pilot health centres electrification;
  - Training for the person responsible in each health centre for the operation and maintenance of the installed solar systems. At least 5 persons from each State will attend this special training.

  The involvement of WHO in the project is essential for increasing the level, quality and continuity of health services provided through the project and articulates the efforts of the provision of energy services with the provision of health services.

- The main focus of **UNHABITAT** in Sudan is developing sustainable urbanisation through participatory techniques, slum upgrading, land conflict prevention and community involvement in all plans, projects and strategies. UNHABITAT is currently implementing two projects in the Darfur region:
  - Institutional Capacity Development in Darfur of Urban and Regional Planning and Land Management
  - Peace Building in Darfur through Resource Management and Livelihoods

The involvement of UNHABITAT in the Project is important in two ways. First, it has a physical presence in the region through different projects. All of these project activities require some kind of energy input to functioning properly; e.g. the project can introduce the PV technology to improve the delivery of health care services. Second, the project can also be linked and benefit from the geographical existence in the region besides learning from the participatory experiences adapted by UNHABITAT to ensure active and gender inclusive participation of village communities in determining the need for energy services in villages and locating the site for PV system installation.

- **Ministry of Water Resources and Electricity (MWRE):** The MWRE is implementing a large solar project for rural electrification. The project aims to provide standalone solar systems (lighting and TV sets) for 1.5 million households in rural Sudan by 2016. Currently the pilot project phase is implementing in 5 States. The involvement of the MWRE is to build on the experiences further to scale-up the solar project by inclusion of more villages in Darfur region in this solar rural electrification project.

- **National Energy Research Centre (NERC):** The NERC has wide experiences in the solar systems' quality control, installation, operation and maintenance. Besides NERC developed and provides training course in solar energy for various groups including the vocational training centre in North Kordofan and others centres. Thus NERC can provide the technical backstopping for the project in terms of ensuring the quality and proper installation of the systems selected. Additionally, the NERC through implementation of the presidential initiative of rural electrification of the border villages between Sudan and Chad has developed working experiences in Darfur region. Additionally NERC established a Solar Encapsulation and Manufacturing Unit since 2003 for assembling solar modules and other PV components. The PV testing facilities of the unit will also be used to ensure the quality of the solar system provided by the private sector.

3.4 Gender equality

The Project considers gender issues related to energy access a high priority; since women are responsible for the provision of nearly all household' energy services (fuel for cooking and light). During the Darfur women's consultations in relation to gender and energy access, the women concluded the following:

a) Women and men have different roles in the energy system: women bear the main burden of providing and using biomass energy for cooking. A situation made worse by fuel scarcity; and negative, health and safety impacts as well as a security risk in insecure areas.

b) Women bear the invisible burden of the human energy crisis - women's time and effort in water pumping, agricultural processing, and transport. They need modern and more efficient energy sources to improve their work and quality of life both within and outside the home.

c) Women have less access than men to the credit, extension, land and training, necessary for improving energy access to support their livelihoods and income generation from micro-enterprises.

d) Women and men have different kinds of knowledge and experience of energy, either through their traditional roles, their new non-traditional roles (especially in female-headed households), or increasingly as professionals in the energy sector.

e) Since women experience poverty differently to men, they may need different energy policies to help them escape energy poverty: new energy technologies can even have unintended negative consequences for women, as has happened in the past with other new technologies e.g. in the Green Revolution.

It is also proposed that gender issues will be mainstreamed in governance and decision making processes related to policy development, implementation and monitoring service delivery and financing of sustainable energy services. It is also important to promote increasing women's participation and leadership in energy businesses opportunities and energy institutions in Darfur. Inter-sectoral dialogue and consultations with key actors from government, civil society and private sector and community leaders is important to discuss gender equality and women's needs and priorities as related to sustainable energy services. However, women will generally benefits from all energy services, but specifically women are targeted by the services of pumping water, mobile Lantern lamp and lighting of the women development centres.

4. Feasibility, Value for Money, risk management and sustainability of results

The application of solar energy technologies in Darfur to improve the accessibility to rural energy services such as illuminating the darkness, water pumping for domestic water supply and irrigation and cooling for medicinal purposes is vital for the development of the region. This is because the other conventional alternatives (Grid connection & Oil products) of supply such energy services are quite difficult due to remoteness and poor infrastructure. As shown that there are only 5 cities supplied by thermal plants which have limited capacity and are not sufficient to be extended outside these cities. Poor roads network in the region presents an additional challenge for the transportation of oil products.

Solar-powered street lighting, as is currently being installed in previously mentioned villages, provides an opportunity for improving security and movement of persons, especially for women and children, in IDP camps and rural villages. Solar lighting sets in community centres, women's centres, health posts and police stations would play a major role in extending the useful life of these buildings and make it possible for their use after people had finished work for the day. It would also be seen as a major "peace dividend".

Due to limited and unaffordable access to modern energy services in Darfur States, the public centres such schools, clinics, core municipal centres and other public centres are not able to operate functionally. As a result, the region is plagued by inefficiencies that severely limit opportunities to generate economic activities, jobs and additional incomes which perpetuate the state of poverty and poor livelihoods conditions. Solar energy can effectively address these problems of lacking the electricity services.

The provision of these electrical services through conventional sources of energy such as diesel generators or the extension of the grid is very difficult and costly option. Generally, the modern energy services are unavailable and/or unaffordable to the majority of the states' population. For example local diesel generators provide electricity services at a cost of SDG1.4/kWh. Calculated price of power generation for a solar system provides a cost of SDG 0.5/kWh (life cycle cost). This rough estimation shows that the cost of electricity generation in Darfur through the solar system is three folds less that of the diesel generation. So, the comparative economic analysis between solar and conventional sources in the Darfur region is in the favour of using solar energy. Other advantage includes the continuous flow of electricity services due to dependence on free, renewable supply source of energy.

Thus the sue of solar energy for power generation in the Darfur region is economically viable option, using little resources, securing the flow of electricity services and addressing real livelihoods energy related problems. The sustainability of these seen benefits is ensured through supporting the functioning of the market mechanism to provide the PV energy technology components in the local market, the creation of linkages with micro-finance mechanism to facilitate the purchase of solar technology by households and individuals and building the technical capacity of local private sector to provide after sale services (installation, operation and maintenance services).

5. Results Framework

The project will assist the government of Sudan to achieve its DDS objectives and the purpose of the project is to access the clean, reliable and affordable energy services for the people of Darfur Region. In particular, the project outputs will contribute to the objective 3 under pillar II (increase access to electricity services). The linkages of these output components are detailed the following outputs and summarised in Table 4 below:

Output 1: Different solar systems procured and installed in 70 villages (7,000 households) including community services such as schools, health clinics, streets, police stations, women centres and others

The primary focus of the project is to establish demonstration plots in the public service area – streets, hospitals, municipal offices, women centres, community centres, police stations, schools and potential area – to access the clean, reliable and affordable energy through PV lighting. At the same time, the project will promote lighting and productive uses of solar energy in the rural villages. It would include a marketing campaign, using communication channels which reach women and men, as well as business development assistance, tailored specifically to encourage men and women –link with SME – in rural areas. This project component would be tested firstly in areas that had been electrified by standalone solar energy, and then expanded to project areas by linking with Micro Finance activities under Output 3. The detailed activities comprise solar home systems (lighting and mobile chargers), school systems (lighting and computers), health centres (light for emergency obstetrical care, lighting and refrigerator), street lighting and lighting for other public services. The project will work with the Darfur Regional Authority, Darfur State Governments, Ministry of Water Resources and Energy, National Energy Research Centre, private companies and CBOs.

Output 2: Technical assistance provided to ensure that installed solar systems are operated and maintained by the users

The project will provide the following technical assistance to ensure for users of both gender to operate and maintain the PV lighting and productive use of solar energy:

a) ***Development of institutional framework and strengthen regulations for off-grid rural electricity service***, including solar energy service provision, specifically designed to improve the economic and financial efficiency of the sector, such as procedures for issuing rural concessions; norms for solar energy systems design and construction appropriate for rural areas; norms for operations; procedures for calculating rural tariffs; and norms for rural quality of service.

b) ***Capacity building for identification and development of solar energy,*** which are effectively linked to Darfur Regional development plan. The project would strengthen the capacity of solar energy service providers to implement the project activities efficiently and effectively, as well as strengthen the capacity of regional and local governments to coordinate planning and management of rural electrification projects with other rural development activities. The project would assist to form the mixed gender Community Based Rural Electrification Committee and provide technical assistance on maintenance and financial management activities via gender sensitive (sex-disaggregated bathrooms, etc.) vocational training centres, also encouraging the participation of women.

c) ***Promotion of solar energy,*** including: (i) link with the UNDP funded projects – Solar Pumping Project – and development of appropriate policies and gender sensitive incentives for the solar energy; (ii) learn lessons from the project and share the best experiences, particular how to include women, for future activities and (iii) carrying out technical studies. This component would focus on solar energy including other renewable energy for rural electrification and supply to the grid in future.

Output 3: Enabling environment created and scaled-up plan implemented through establishment of financing and dissemination mechanism

The project will work with Darfur Regional Authority, Darfur State Government, Ministry of Water Resources and Electricity and Commercial Banks operating in Darfur region– notably the Agricultural Bank of Sudan, the Farmers Bank, the Saving and Social Development Bank – to systematize their micro-finance lending for Solar Home Systems, to develop the internal capacities of the banks to structure micro-finance loan packages and assess loan risks and to market innovative financial products, including specialized products targeted at the female market, to drive local people take-up of PV lighting in the off grid area. MF lending decisions will rest with the banks and, for the purposes of fostering a competitive lending market, the banks will be encouraged to design and market their own micro-finance products after receiving training in how to design gender sensitive products. Nonetheless, the project, in conjunction with the Darfur Regional Authority, will help to impose coherence across these market offerings by:

a) Establishing a set of criteria that micro-finance products must meet (including a cap on bank charges[4] and a minimum loan tenor) in order to qualify as micro-loans under the 12% quota mandated by the Central Bank of Sudan.

b) Developing and maintaining a monitoring system: establishment of a central register of qualifying loans, regular sex-disaggregated surveys of consumer awareness, customer satisfaction, Solar Home System equipment market prices, SHS equipment quality and retailer sentiment. Such robust, comprehensive and regular monitoring is intended to facilitate early detection of market developments and to enable programme design adjustments as and where necessary.

c) Imposing a set of minimum SHS unit hardware standards and ensuring that banks lend only on the basis that certified hardware is used.

[4] Sudanese banks apply the Sharia form of Islamic banking, under which bank charges are levied but interest rates are not applied.

The project is innovative in addressing a technology that has considerable potential in the rural electrification sector where limited access of grid in the Darfur Region. The deployment of micro-finance is long term sustainable of the project financing mechanism and the micro-finance loan products developed will undoubtedly be innovative: traditional bank loans are too expensive (high bank charges) and are not targeted at small-scale counterparties such as farmers and female customers, and micro-finance is a novel financial modality in Sudan (having been introduced only in 2008 and hitherto having largely been a donor-funded – as opposed to commercially oriented – activity). The issue of sustainability is addressed through a systematic, gender sensitive barrier removal strategy and linking with Micro Finance scheme that is intrinsically more sustainable than grants. The prospects for nationwide scaling-up of the model developed by the project for Darfur Region are considerable, and a replication programme will be developed for this specific purpose.

Output 4: Awareness for the renewable energy potential raised and Renewable Energy ATLAS for Darfur region developed and implemented

The project will develop a website with the aim to share project information and activities of technical and policy level coordination committee. Initially, the project will maintain the website and gradually transfer this technology to the Darfur Regional Authority with the technical assistance of Renewable Energy department at MWRE to ensure follow up of the flow of new information and continuous updating of the website. The website will become source of information for energy related activities and will upload energy relevant information, research findings, appropriate and advance technologies regularly, highlighting also gender best practices. The stakeholders have easy access to energy related information and learn lessons from past experiences. Moreover, a distance learning course for renewable energy will be develop and uploaded on the website for specific capacity building. All these coordinated effort toward more transparent through access to information, knowledge and management issues. The project will deliver:

- **a.** a programme website active with individual project page;
- **b.** renewable energy ATLAS for Darfur Region;
- **c.** research publications;
- **d.** annual work programme for distance learning courses; and,
- **e.** a work programme for use of resource materials and media outreach.

Table 4: Results Framework

JP/ Project Title	Darfur Solar Electrification Project					
DDS Pillar	**PILLAR II: RECONSTRUCTION**					
DDS Objective	**Pillar II, obj:3:Increased access to electricity services**					
Relevant DDS Pillar Priority:						
JP/ Project Outputs	**UN Organisation**	**Other Implementing partner(s)**	**Performance Indicators**	**Baseline**	**Target**	**Means of Verification**
1. Different solar systems procured and installed in 70 villages (7,000 households), including community services such as schools, health clinics, street lamps, police stations, women centres and others	UNDP, UNDO, WHO	MWRE, NERC, DRA	1 Number of villages equipped with solar systems 2 Number of services in each village equipped with solar systems 3 Population benefited 4 Percent of benefited women from the total population 5 Number of pupils befitting from school lighting, sex-disaggregated	30 villages are electrified by solar system in 2005 by NERC as part of the presidential initiative to electrify the broader villages	70 villages	Monitoring reports on physical installation / Evaluation reports
2. Technical assistance provided to ensure that installed solar systems are operated and maintained by the users	UNDP, UNIDO		1 Numbers of PV courses conducted in the vocational training centres. 2 Number of trainees on the operation and maintenance (disaggregated by sex) 3 Number of vocational training students graduated with PV specialisation.	All the solar project installations were accompanied by community training. The PV curriculum will be developed for the vocational training centre in Darfur State.	70 villages 2 vocational training centres	Project quarterly and annual Reports & Studies
3. Enabling environment created and scaled-up plan implemented through establishment of financing and dissemination mechanism	UNDP, UNDO, WHO		1 Conducive Polices proposed 2 Scale-up plans for Darfur States formulated and operationalised	MWRE developed a national plan to electricity 1.5 million households by 2016 through provision of standalone off-grid solar systems.	5 states of Darfur	Documents of formulated polices and plans
4. Awareness for the renewable energy potential raised and Renewable Energy ATLAS for Darfur region developed and implemented	UNDP,UNIDO, WHO, UNHABITAT		1. Number of awareness campaigns conducted 2. Number of awareness materials produced and communicated. 3. Gender specific awareness campaign conducted, sex-disaggregated number of people reached 4. Renewable Energy ATLAS prepared	No		Project quarterly and annual Reports

6. Human rights based approach (HRBA)

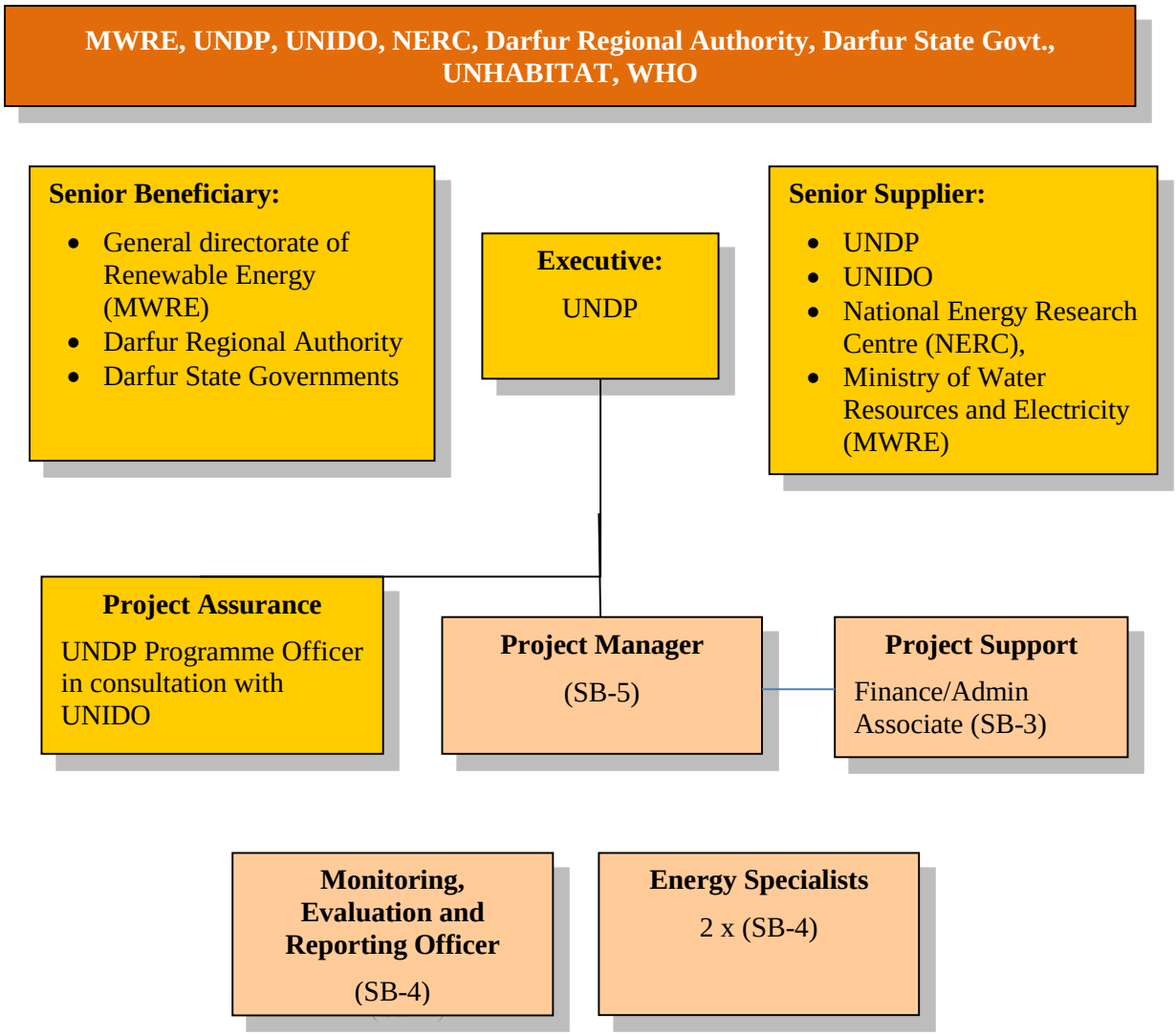
According to the experiences of Sudan, energy needs and access to energy services are highly differentiated by gender, age, wealth and ethnicity. So, the HRBA is streamlined through all phases of the project preparation, implementation, monitoring and evaluation. This streamline process facilitates identifying the energy needs of women and the vulnerable groups. In the project preparation phase, the project will take into account of HRBA during the participatory energy assessment survey of solar systems in consultation with various local groups. The identification of these needs and results will lead the designing process of the solar systems. As a result, the use of different solar systems that meet the needs of diversified groups will implemented by the project and continuous monitor the project activities. This include systems for different services for example community clubs which is attended by men and women, development centres which are attended by women; and the distribution of mobile solar lamps which can be used by elders, youth and the disable persons. Thus the project enhance the equity issues of allocating the solar systems and access to energy services and avoid exclusion of any interest or beneficiary groups with the community.

7. Management and Coordination Arrangements

The project will be jointly implemented with UNDP and UNIDO through the UNDP Direct Implementation Modality (DIM). The project will operate in the Darfur Region and UNDP will implement this project mainly through Letters of Agreements with the MWRE and NERC. The **Project Board** which is composed of **MWRE, UNDP, UNIDO, NERC, Darfur Regional Authority, Darfur States Governments, UNHABITAT, WHO** is responsible for making management decisions for the project and provide guidance whenever needed with regard to the project components and activities. The PB plays a critical role in the project monitoring and evaluations by quality assuring these processes and products, and using evaluations for performance improvement, accountability and learning. It ensures that required resources are committed and arbitrates on any conflicts within the project or negotiates a solution to any problems with external bodies. In addition, it approves the appointment and responsibilities. Based on the approved Annual Work Plan, the Project Board can also consider and approve the annual plans and also approve any essential deviations from the original plans. The Board contains three distinct roles, including:

- **An Executive**: Individual representing the project ownership to chair the group. A Representative of the UNDP.
- **Senior Supplier:** Individual or group representing the interests of the parties concerned which provide funding for specific cost sharing projects and/or technical expertise to the project. The Senior Supplier's primary function within the Board is to provide guidance regarding the technical feasibility of the project. UNDP, UNIDO and NERC will fill this role.
- **Senior Beneficiary:** Individual or mixed gender group of individuals representing the interests of those who will ultimately benefit from the project. The senior beneficiary's primary function within the board is to ensure the realization of project results from the perspective of female and male project beneficiaries. The Ministry of Water Resources and Electricity (Renewable Energy Dept.), Darfur Regional Authority, Darfur State Govt. and National Energy Research Centre.
- **The project Assurance** role supports the project board executive by carrying out objective and independent project oversight and monitoring functions. A UNDP and UNIDO Programme Officer will hold the Project Assurance role.

Project Manager: The NPM has the authority to run the project on day to day basic within the constraint laid down by the PB. The NPM is accountable to the UNDP, the IP and the PB for the quality, timeliness and effectiveness of the activities carried out as well as for the use of funds. The National Project Manager will be recruited by the UNDP according to its HR policy. He/she will also be responsible for coordinating budgets and work plans on the State Level and will be supported by monitoring, evaluation and reporting officer and two engineers. His/her salary and indemnities will be paid for by the project.



Project Support: A Monitoring, Evaluation and Reporting Officer will provide the monitoring and evaluation functions, ensuring that it is gender sensitive and will be responsible of the reporting and documenting the projects activities and successes; **Two Technical Specialists** will provide technical back stopping of the rural electrification including solar energy activities; **A Project Associate** will be recruited to provide administrative, financial and technical support to the Project.

8. Funds allocation and Cash Flow Management

The project as mentioned is a direct implementation (DIM) led by UNDP. UNDP is managing the allocation of funds for the different components and disbursement of fund between the participating UN agencies and implanting institutions. The allocation of fund will be based on the activities and roles performed in the project implementation. The following Table 5 summarises the allocation of funds between the different project components.

Table 5: Allocation of fund for project activities

Component	Cost Item	Estimated cost
1.	Different solar systems procured and installed in 70 villages (7,000 households) including community services such as schools, health clinics, streets, police stations, women centres and others	**4,500,000**
2.	Technical assistance provided to ensure that installed solar systems are operated and maintained by the users	**200,000**
3.	Enabling environment created and scaled-up plan implemented through establishment of financing and dissemination mechanism	**150,000**
4.	Awareness for the renewable energy potential raised and Renewable Energy ATLAS for Darfur region developed and implemented	**120,000**
Operational cost*		**300,000**
Total Project Operational Cost		**5,270,000**
GMS (7% of total)		**368,900**
Project Grand Total		**5,638,900**

See detailed operational cost in Annex 1

Transfer of cash from the fund to participating agencies, and to national Implementing Partners:

The arrangement for the transfer of cash is agreed between UNIDO and UNDP in which UNIDO will spend US$ 200,000 in the component for the capacity building and training purposes. Other partners include MWRE and NERC will utilize the fund through UNDP's financial procedure[5] on the procurement, transportation and installation of the solar system in the 70 villages.

9. Monitoring, Evaluation and Reporting

Under the management of the **National Project Manager, a Monitoring, Evaluation and Reporting Officer** will provide the monitoring and evaluation functions and will be responsible of the reporting and documenting the projects activities, gender sensitivity and successes; **Two Engineers** will provide technical back stopping of the rural electrification including solar energy activities; **A Project Associate** will be recruited to provide administrative, financial and technical support to the Project.

Within the annual cycle the following gender sensitive M&E activities will be ensured:

- On a quarterly basis, a quality assessment will record progress towards the completion of key results, including gender mainstreaming progress.
- An Issue Log will be activated in Atlas and updated by the Project Manager to facilitate tracking and resolution of potential problems or requests for change.
- Based on the initial risk analysis submitted (see annex 1), a risk log will be activated in Atlas and regularly updated by reviewing the external environment that may affect the project implementation.
- Based on the above information recorded in Atlas, a Quarterly Progress Reports (QPR) will be submitted by the Project Manager to the Project Board through Project Assurance, using the standard report format available in the Executive Snapshot.

[5] a) The national implementing partners will submit the quarterly Funding Authorisation and Certificate of Expenditure (FACE) form to UNDP in accordance with the approved AWP, progress report of the previous quarter, work plan for the next quarter with breakdown of the estimated expenditures for release of funds; b) Harmonised Cash Transfer (HACT) modality will be applied for direct cash transfer to the national implementing partner, reimbursement of expenditures using FACE; c) In the event the national partners are not yet micro-assessed UNDP will apply its own guidelines for annual audit if the annual expenditures exceed $300,000; d) If there is a request for a budget revision, the national implementing partners will liaise with the UN Coordinating Agency and submit official letter to UNDP for final approval.

- A project Lesson-learned log will be activated and regularly updated to ensure on-going learning and adaptation within the organization, and to facilitate the preparation of the Lessons-learned Report at the end of the project, including a section on gender mainstreaming best practices and lessons learned.
- A Monitoring Schedule Plan will be activated in Atlas and updated to track key management actions/events
- **Quarterly Review Report**. A Quarterly Review Report will be prepared by the Project Manager and shared with the Project Board. As minimum requirement, the Quarterly Review Report will consist of the Atlas standard format for the QPR covering the whole year with updated information for each above element of the QPR as well as a summary of results achieved against pre-defined targets at the output level.
- **Final Project Review**. Based on the above report, a final project review will be conducted soon after the fourth quarter of the year to assess the performance of the project and appraise the Final Work Plan (AWP) for the following year, including how gender mainstreaming can be strengthened in the following year. In the last year, this review will be a final assessment. It will focus on the extent to which progress is being made towards outputs, and that these remain aligned to appropriate outcomes.

Table 6: Joint Programme Monitoring Framework (JPMF)

Expected Results (Outcomes & outputs)	Indicators (with baselines & indicative timeframe)	Means of verification	Collection methods	Responsibilities
Different solar systems procured and installed in 70 villages (7,000 households) including community services such as schools, health clinics, streets, police stations, women centres and others	1. Number of villages equipped with solar systems 2. Number of services in each village equipped with solar systems 3. Population benefited 4. Percent of benefited women from the total population 5. Number of pupils befitting from school lighting, sex-disaggregated	Project quarterly and annual Reports & Studies	Report and visits	UNDP, MWRE, NERC, WHO, UN Habitat, DRA
Technical assistance provided to ensure that installed solar systems are operated and maintained by the users	1. Numbers of PV courses conducted in the vocational training centres. 2. Number of trainees on the operation and maintenance (disaggregated by sex) 3. Number of vocational training students graduated with PV specialisation.		Report	UNIDO, NERC
Enabling environment created and scaled-up plan implemented through establishment of financing and dissemination mechanism	1. Conducive Polices proposed 2. A scale-up plans for Darfur States formulated and operationalised			UNDP, MWRE,DRA
Awareness for the renewable energy potential raised and Renewable Energy ATLAS for Darfur region developed and implemented	1. Number and types of studies conducted 2. Number of studies carrying out gender 3. Gender sensitive awareness campaign conducted, sex-disaggregated number of people reached 4. Renewable Energy ATLAS	Project quarterly and annual Reports	Minutes of meeting	UNDP,DRA

10. Work plans, activities and budgets

The project is planned to be implemented in 18 months with a total budget of nearly US$5.64 million out of which US$4.5 million is devoted for systems procurement and installation. The project will provide standalone solar systems in all services in the village. In each of the 70 proposed villages different combinations[6] of the systems will be installed. Details of each system components and suitability for different community services are shown below:

A) Solar lighting system for public buildings[7]:-

The solar lighting system is proposed for the key informant's house, ensuring a gender balance and making sure that women can also access this space, recording sex-disaggregated data of who was provided with access, (i.e. medical assistances and teachers' house) in each village. This system consists of one SPV system, which operates four to nine watts Compact Fluorescent Lamp (CFL-9). Out of four

[6] Due to the fact that villages vary in the number and type of built services not all types of systems are suitable for all villages. There are large village in which services are centred (schools, health centres, water wells, police station etc. etc.) and there are also small villages with only primary schools and health dressing unit.

[7] there will be 2 systems per school to light 3 to 4 classrooms

lamps, two may be operated for three-hour/day and the other two may be operated for around two hours each day. The lamps will be installed at suitable locations, which can be accessed by male and female members of the community, inside the house and operated as per the individual need.

The system comprises one SPV module of 50 Wp, a module support structure, a charge controller, a 12-VDC battery, four CFL-9 luminaries and necessary wires/switches. The system proposed for house lighting system has the following specifications:

a. Nominal PV array capacity	50 Wp
b. Battery capacity	12 V Dc, 65 Ah
c. Charge Controller	12V, 6/8 A
d. Luminaries	12V, 9 W (4 pcs.)

B) Street Lighting System

Three to five Street Lighting Systems have been considered for illuminating some places in the village according to the perceived needs by the villagers. The system essentially comprises an SPV module, solar battery, one weather proof 11 W compact Fluorescent Lamp (CFL-11) with built-in inverter, timer and charge controller circuit and interconnecting wires all mounted suitably on a 4.5 meter long galvanized iron pole. Electricity generated by the SPV panel is stored in the battery. The electronic circuit senses the dusk through the SPV panel, switches ON the lamp, operates it for whole night and turns it OFF at dawn automatically. Each Street Lighting System has the following performance characteristics.

a. Nominal PV array capacity	75 Wp (or 2 pcs x 50 Wp)
b. Battery capacity	100 Ah, 12 V Dc
c. luminaries with charge controller	12 V, 11 W (1 set)
d. Galvanized pole	4.5 m (1 pcs)

C) SPV System for a Computer in the School

It is proposed to provide Solar Power Pack for operating a computer for three hours per day, printer for one hour per day in the school (operating on 220 VAC, 50 Hz). The system comprises a SPV panel of 300 Wp capacity, a Module Support Structure, a charge controller, a 12 V, 360 AH Battery Bank, an Inverter and the necessary wires/cables. The system has the following performance characteristics:

a. Nominal PV array capacity	300 Wp (6 pcs, 50 Wp/ 4 pcs 75W)
b. Battery capacity	360 Ah (120 Ah, 3 pcs.)
c. Charge controller	12V, 30 A
d. Inverter capacity	800 V A, 12V
e. Lamps	14 W CFL (2 pcs.)

D) DPV System for religious buildings

For the religious buildings, it is proposed to have a power pack for a Public Address System, as well as some lights. The system comprises a SPV panel of 100 Wp capacity, a Module Support Structure, a charge controller, a 12 V, 120 AH Battery Bank and the necessary wires/cables. The system has the following performance characteristics.

a. Nominal PV array capacity	100 Wp (50 W, 2 pcs.)
b. Battery capacity	12 V Dc, 120 Ah
c. luminaire	9 W, (8 pcs)
d. charge controller	8/10 A

E) Community TV System

A Community TV System will enable the villagers to have get-together in a common place during the evening hours. The Community Room will have a power point for one colour Television (operating on 220 VAC, 50 Hz) and a VCR operating for five to six hours every day. The system comprises a SPV

panel of 300 Wp capacity, a Module Support Structure, a charge controller, a 12 V, 360 AH Battery Bank, an Inverter and the necessary wires/cables. The system performance characteristics are as follows:

a. Nominal PV array capacity	300 Wp (6 pcs, 50 Wp/ 4 pcs 75W)
b. Battery capacity	360 Ah (3 pcs, 120 Ah)
c. charge controller	12V, 30 A
d. inverter capacity	500 V A, 12V
e. lamps	14 W CFL (2 pcs.)

F) Women Development Centre (WDC)

Usually women do not attend community services, such as youth clubs, and girls cannot go to school at night. Thus, women development centres are places where women and girls can benefit from the solar project. The women development centres will be equipped with a solar system sufficient to provide lighting and run a satellite TV set, so, the women development centre service is equivalent to the Community TV System in (E) above; ensuring that women have equal access to the same services granted for men in the Community TV System. Besides, the lighting system in the WDC provides space, for school girls to do their homework, review their classes and prepare for their examinations.

a. Nominal PV array capacity	300 Wp (6 pcs, 50 Wp/ 4 pcs 75W)
b. Battery capacity	360 Ah (3 pcs, 120 Ah)
c. charge controller	12V, 30 A
d. inverter capacity	500 V A, 12V
e. lamps	14 W CFL (2 pcs.)

G) Health Centres

One small refrigerator shall be installed in the health centre to store live saving drugs and vaccines. It will also have 4 lights placed at suitable locations. The system comprises SPV panel of 300 Wp capacity, a Module Support Structure, a charge controller, a 24 V, 200 AH Battery Bank, an Inverter and the necessary wires/cables. The system performance characteristics are as follows.

a. Nominal PV array capacity	300 Wp (6 pcs, 50 Wp/ 4 pcs 75W)
b. Battery capacity	24 V, 200 Ah
c. Charge controller	24 V, 30 A
d. Inverter capacity	1400 V A, 24 V
e. lamps	14 W CFL (4 pcs.)

H) Solar Lantern

It is proposed to provide four SPV lanterns to each village. The lanterns can be used as mobile light sources, as well as for lighting applications inside the home. The lanterns will be distributed by LIUs/CBOs in a gender equitable way to those who provide useful services to the community, such as the mid-wives and health servants who need to provide emergency services to patients in their homes (night delivery, traumas, sick elders…etc.). The SPV lantern unit consists of a 10 Wp SPV module and a portable lantern assembly. The controller and inverter are housed in the light-weight portable casing. The lantern can operate for three to four hours on a full charge.

I) Solar pumps

As a common practice in Darfur is to pump water from underground, a submersible solar pump set will be used in this project. As the name implies, it pumps water from below (whether from a well or from surface sources) to a higher position. The size of the pump components and the number of solar modules to be used varies with the total pumping head and the daily volume of water required. Generally, a typical solar pump set is composed of the following components:

a. Submersible solar pump

b. Controller PS 4000

c. Water level sensor for dry run protection + wire.

d. Solar Module

e. Bolted structure for modules mounting, it withstand high wind speed (40 m/s)

f. Pump Drop Cable: flexible 4 core cable with 4x6 mm^2

g. Pump Safety wire, Rust proof type

h. Galvanized steel pipes (Diameter 4 inch, 3 meters long, threaded on both sides)

i. Steel box for controller + pipe fittings + wires

J) Telecommunication system

Solar systems can also be used to power a rural telephone system, accessible to both men and women. There is wide range of applications of this system in Sudan. It is proposed for police stations, which use a radio telecommunication system.

The system for telecommunication has the following specifications.

a.	Nominal PV array capacity	50 Wp
b.	Battery capacity	12 V Dc, 65 Ah
c.	Charge Controller	12V, 6/8 A

Duration of the JP/Project: 18 Months

Table 8: Work plan of the Promoting Access to Clean Energy Services in Darfur Region

Specific Objectives of the Fund:										
Expected products of the JP/project	**Key activities**	**Calendar (by activity)**						**Geographic area**	**Responsible Participating Organisation**	**Planned budget (by product/ activity)**
		Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**			
JP Outputs										
Output 1.	Different solar systems procured and installed in 70 villages (7,000 households) including community services such as schools, health clinics, streets, police stations, women centres and others							Darfur States	UNDP/WHO/UNICEF/NERC/MWRE	**4,500,000**
Output 2	Technical assistance provided to ensure that installed solar systems are operated and maintained by the users								UNDP/UNIDO	**200,000**
Output 3	Enabling environment created and scaled-up plan implemented through establishment of financing and dissemination mechanism								UNDP/UNIDO	**150,000**
Output 4	Awareness for the renewable energy potential raised and Renewable Energy ATLAS for Darfur region developed and implemented								UNDP/WHO/UNICEF/NERC/MWRE	**120,000**
M & E – Evaluation										
Total Operational Cost	Travels + Communication + meetings								UNDP/WHO/UNICEF/NERC/MWRE	**20,000**
	Evaluation missions + audit cost								UNDP/WHO/UNICEF/NERC/MWRE	**30,000**
	Staff and other operational cost								UNDP	**250,000**
Operational Cost										**5,270,000**
GMS (7%)										**368,900**
Grand Total										**5,638,900**

Table 9: Budget by Participating UN Organisation, using UNDG Budget Categories

UN FUND FOR DARFUR JOINT PROGRAMME BUDGET*			
CATEGORIES	**UNDP**	**UNIDO**	**Total**
1. Staff and other personnel costs	100,000		100,000
2. Supplies, Commodities, Materials	100,000		100,000
3. Equipment, Vehicles and Furniture including Depreciation			
4. Survey of solar systems for pilot areas			
5. Contractual Services – Companies	4,500,000		4,500,000
6. Travel	20,000		20,000
7. Transfers and Grants to Counterparts		250,000	250,000
8. General Operating and Other Direct Costs**	300,000		300,000
Sub-Total Project Costs	5,020,000	250,000	5,270,000
7% Indirect Support Costs ***	351,400	17,500	368,900
Grand TOTAL	**5,371,400**	**267,500**	**5,638,900**

***** Budgets adhere to the UNDG Harmonised Budget Categories, as approved by the High Level Committee on Management (HLCM) and Chief Executives Board for Coordination (CEB).

****** see annex 1 for details of project operation components

*******Indirect support cost is in line with the rate of 7% GMS, as specified in the UN Fund for Darfur TOR and MOU and SAA, Section II- Financial Matters. The 1% UNDF Management Fee is deducted at source from the original contribution and does not affect the Project Budget.

ANNEXES:

Annex 1: Project operation expenses

The operation expenses are summarised in the following table. It includes the expenses of human resources, operation cost, Stationary & Material for project offices and monitoring and evaluation expenses.

Cost item	Annual cost	2015 (1st batch-3 months)	2016 (2nd batch-12 months)	2017 (3rd batch-3 months)	Total (18 months)
Human Resources					
National Project Manager (SB4-5)	20,500	5,125	20,500	5,125	30,750
Finance and Admin Assistant + Data Assistant (SB-Q3)	8,800	2,200	8,800	2,200	13,200
Two project Engineers	28,400	7,100	28,400	7,100	42,600
One drivers (SB1/Q3-2)	6,000	1,500	6,000	1,500	9,000
Sub-Total (A)					95,550
Operation cost					
Rent of vehicles	20,000	5,000	20,000	5,000	30,000
Fuel + repairs, maintenance & lubricants (vehicle and generator)	25000	6,250	25,000	5,000	36,250
Sub-Total (B)					66,250
Stationary & Material for project offices					
Stationary	6,000	1,500	6,000	1,500	9,000
Equipment repair and maintenance (project offices)	9,000	2,250	9,000	2,250	13,500
Internet usage + communication	4,000	1,000	4,000	1,000	6,000
Project office running cost (rent+water + electricity)	8,000	2,000	8,000	2,000	12,000
IT equipment purchase (4 laptops + photocopier + printer)	9,200	9,200	0	0	9,200
Office furniture	6,000	6,000	0	0	6,000
Sub-Total (C)					55,700
M&E					
M&E related travel expenses (1 visits each villages, 3 days each,3 persons)	25,000	6,250	25,000	6,250	37,500
Inception and PSC meetings	10,000	5,000	10,000	0	15,000
Audit costs	30,000	0	0	30,000	30,000
Sub-Total (D)					82,500
Grand total (A+B+C+D)					**300,000**

Annex 2: OFFLINE RISK LOG

Project Title: Promoting Access to Clean Energy Services in Darfur Region	Award ID:	Date: 1 July 2014

#	Description	Date Identified	Type	Impact & Probability	Countermeasures / Mngt response	Owner	Submitted/ updated by	Last Update	Status
1.	Due to the on-going conflicts and civil unrest in the Darfur, there is a potential of vandalism reactions results damage of the solar systems.	Conflicts in Darfur flared in 2003.	Political and Social	P = 4 I = 4 Out of 400 systems installed during 2012 by NERC in 30 villages in Darfur region, there were 2 systems subject to such vandalism.	To address this risk participating villages in the project will selected among areas proved to be safe and will protected. The DRA, State governments, UNDP, local authorities and community leaders will be involved in the selection processes. Selection criteria will be developed with active participation of all shareholders and local actors in the development processes in the Darfur including NGOS, managers of projects currently under implementation.	UNDP, DRA	UNDP		
2.	Risk of theft of solar systems.	In 2012 some solar system components such as batteries and modules.	Social	P = 2 I = 3	The protection measures include: well fencing for the modules Use strong modules support and battery boxes	WMRE, NERC	UNDP		
3.	Technical capacity of local communities and stakeholders lower the proper operation and maintenance of the system.	2011	Institutional	P = 2 I = 3	The project involves on the job training by involving communities and the stakeholders during the system installation in order to develop technical capacities.	UNDP, DRA, MWRE, NERC	UNDP		
4.	Delay in the identification and installation of solar system due to some area due to security situation	2013	Political	P = 3 I = 4	The project will coordinate with the DRA and States Authorities to ensure the timely delivery of the system for installation and quick response to replace areas/villages that cannot be reached				
5.	Risk of conflicting interests among energy institutions reduces effectiveness of the coordination mechanism.	2014	Administrative	P = 2 I = 3	To minimise this risk the coordination mechanism should be established under a high level government authority to make mandatory recommendations and decisions.	UNDP, DRA, WMRE, NERC	UNDP		

Annex 3: Checklist to assess integration of gender in DDS proposals

1. Does the context analysis identify gender gaps in the project's area of intervention
   Yes ☒ No ☐

   If yes, how?

   The DDS identifies the gender gap related to education access for girls and vulnerable populations and other gender concerns. Particular to this project the DDS identifies that about 65% of the work in the agricultural sector is done by women. Besides women are responsible for fetching water and firewood, often from remote sources which expose them to violence incidences. Besides, Women who live in IDP camps are also vulnerable to well-documented security risks and gender-based violence when collecting firewood and performing other household tasks outside the camps.

2. Does the context analysis of the proposal make use of sex disaggregated data?
   Yes ☒ No ☐

3. Who are the programme/project beneficiaries?

   The direct project beneficiaries are 7,000 returnee households and indirect beneficiaries are 20,000-35,000 households from the five Darfur States. Out of the direct targeted beneficiaries, 45% of households are women headed households. The detailed beneficiaries will identify by the Darfur Regional Authority (DRA), Ministry of Water Resources and Electricity (MWRE), the National Energy Research Centre (NERC), DRA Ministry of Technology and Capacity Building in the preparation phase of the project.

4. To what extent do women and girls benefit from the project interventions?

   The project identifies that women and girls requires special attention in the provision of energy services. The project considers women development centres, women gathering places and women schools are targeted for installation of solar systems. The upgrading of water services through water solar pumps reduces women's burdens on fetching water.

5. Does the programme/project results framework include specific results, and targets in relation to gender equality and women's empowerment Yes ☒No ☐

   Women will be participated in the village lighting committee and training activities which will enhance women participation in high level meetings in the local level and ensure their voice in the decision making process such benefit selection, site selection and maintenance activities.

   Does the project's monitoring framework include measurable gender sensitive indicators and targets at the output and outcome levels? Yes ☒No ☐

   Gender disaggregate data will be carried out in the outputs and outcome level of the project.

7. What share of the programme/project budget directly benefit women and girls?
   Less than 15% ☐ 15%☐ more than 15%☒

   Out of the direct beneficiaries (7,000 returnee households), 45% targeted beneficiaries are women headed households.

Committee recommendation

☐ Recommended

☐ Not recommended

☐ Send for revisions

NB: The committee may recommend adjustments to ensure that the programme addresses identified gender gaps in an effective manner.

Annex 4: Environment and Social Screening Checklist for DDS Projects

Environmental and Social Checklist

Sector	Yes	No	N/A	Yes and Mitigation Possible
BIODIVERSITY				
Will the project require the acquisition or conversion of significant areas of land, including the clearance of vegetation?		✓		
Is the project located in the proximity of protected areas or other areas classified as vulnerable?		✓		
Will the project affect protected or endangered ecosystems or species (e.g. natural forests, wetlands, endemic species, endangered species etc.)		✓		
It the project located in an area prone to recurrent natural disasters? (e.g. floods, drought etc.)	✓			The installation improve the adaptive capacity of the communities to drought by providing energy services that are dependent on natural resources
Can the project introduce, accidentally or intentionally, alien species or Genetically Modified Organisms (GMO's)?			✓	
WATER RESOURCES AND FLOODING				
Will the project lead to changes in the course or direction of water flow? Consider if the project will impact existing water bodies and the extent of this impact. (This also applies to Wadis and any water retention structures built in rivers or wadis.)			✓	
Will the project lead to changes in percolation rates, drainage patterns or the rate and amount of surface water runoff? Will development of your project cause major changes to existing drainage patterns, create additional water runoff potential because of increased impervious surfaces? or change the existing percolation rate of the soil surface that will create a significant problem? Most single family dwellings will not result in these changes at a level of significance. Large tracts are examples of projects that have the potential for this type of significant impact..			✓	
Will the project lead to change in the amount of surface water in any water body? Will the project cause an increase or decrease in the water levels of potentially affected water bodies, streams, lakes, ocean, rivers, etc.)? An example is stream diversions.			✓	
Will the project lead to discharge of chemicals into surface waters, or alteration of surface water quality, including but not limited to temperature, dissolved oxygen, turbidity, solids?			✓	
Will the project lead to alterations to the course or flow of flood waters, or need for private or public flood control projects?			✓	
Will the project lead to excessive abstraction of any groundwater basin?			✓	
Will the project significantly increase the amount of water being available in rangelands, thus attracting too much livestock and leading to overgrazing and range degradation?		✓		

Cont'd

Sector	Yes	No	N/A	Yes and Mitigation Possible
WATER RESOURCES AND FLOODING *(Cont'd)*				
Will the project lead to exposure of people or property to water related hazards such as flooding, or accelerated runoff? Review			✓	

the FIRM maps to determine if your project is located in a potential flood zone. The FIRM maps indicate that a study has been done of this area as it pertains to flooding. If an area is not indicated on these maps as being in a flood zone, it does not mean that there is no flood danger. Mitigations available through implementation of Flood Ordinance 3898 will provide self-mitigating regulations. Contact Flood Control staff to confirm whether your project impacts could be significant.				
Will the project lead to alteration of the direction or rate of flow of groundwater? According to Flood Control staff, development of one or several single family dwellings is not going to create a significant change in the rate or flow of groundwaters. This type of impact will occur when you have large tracts or large areas of non-residential development that creates a significant amount of impervious surfaces.			✓	
Will the project lead to change in the quantity of ground waters, either through direct additions or withdrawals? This question is related to 2(i) below in terms of groundwater withdrawals. "Additions" to groundwater would involve recharge projects (recharge basins or injection wells) which would be analysed primarily for potential groundwater quality impacts. (See 2(j)).			✓	
Will the project lead to change of groundwater quality? Potential water quality impacts of (1) any project involving groundwater recharge, (2) in the vicinity of the coast, or (3) adjacent to a creek or river should be reviewed. The staff geologist will analyse potential salt water intrusion.		✓		
Will the project lead to substantial reduction in the amount of water otherwise available for public water supplies? (This question would relate to the loss of yield of major water supply sources (e.g. large siltation events in a major reservoir caused by vegetation removal in the watershed; a major pollution event which renders some surface water or groundwater unusable)		✓		
Has the project missed consulting any relevant stakeholders (including water users) in the area prior to implementation?	✓			Target groups were not consulted. The project will arrange participatory consultative session during the energy need assessment survey in the project area.
Are the principles of Integrated Water Resource Management (IWRM) ignored in the construction of any water spreading infrastructure?			✓	
LAND DEGREDATION				
Is the project likely to cause soil erosion or degradation?			✓	
Is the project located directly on river banks?			✓	
Will the project lead to sand or gravel removal or loss of topsoil? (Mining operations or similar activities will usually trigger the significance of this section.)			✓	
Will the project lead to excessive grading on slopes of over 20%? Review the site plans and project description. A determination of significance is required when the majority of the proposed project's grading involves slopes > 20%.			✓	

Cont'd

Sector	Yes	No	N/A	Yes and Mitigation Possible
LAND DEGREDATION ***(Cont'd)***				

Will the project lead to changes in deposition, or erosion or siltation which may modify the channel of a river, or stream, or any water body?			✓	
Will construction, operation or decommissioning of the projects involve physical changes, such as topography or land use (e.g. construction, housing etc.)?		✓		
NATURAL RESOURCES				
Will the project require significant amounts of energy, materials or other natural resources?		✓		
Are the needs of the project likely to exceed the capacity of existing transport or other infrastructure?		✓		
Does the project involve harvesting of natural resources?		✓		
Will the project involve natural forest harvesting or plantation development but ignore sustainable forest management?		✓		
Will the project increase household energy demand?	✓			The project will create demands on solar energy technologies. The planned support to the private sector to provide the technology and capacity building activities to provide the after sale services are planned to meet the increased demand for solar energy services.
Does the project fail to utilise alternative building materials including Stabilised Soil Blocks?		✓		
POLLUTION (from routine, non-routine, or accidental sources)				
Will the project result in the production of solid waste (Directly by the project or by workforce)?	✓			Used batteries are solid waste generated by the project. This is mitigated through creation of collection points and linking to the market of the used batteries in city centres.
Will the project result in the production of waste (e.g. used oils, inflammable products, POP's, ODS, hazardous medical waste)?		✓		
Will the project produce effluents (waste water)?		✓		
Will the project produce air pollution (e.g. dust emissions and other sources)?		✓		
Will the project affect surface or groundwater in quantity or quality (e.g. discharges, leaking, leaching, boreholes, etc.)?			✓	
Will the project require use of chemicals? (e. g. fertiliser, pesticides, paints, etc.)?			✓	
Is there any risk of accidental spill or leakage of material?			✓	
Will the project produce significant noise pollution, disturbing nearest settlement?		✓		
Sector	**Yes**	**No**	**N/A**	**Yes and Mitigation Possible**
LAND USE				
Will the project result in structures and/or land use incompatible with existing land use?			✓	
Will the project result in the introduction of substantial growth or concentration of population and livestock?	✓			The provision of services might attract more people to villages equipped with solar energy services.

				This is mitigated through even provision of services to more villages in the region.
Will the project result in the extension of sewer trunk lines or access roads with capacity to serve new development beyond this proposed project?			✓	
Will the project result in the conversion of prime agricultural land to non-agricultural?			✓	
Will the project include activities which will promote agricultural expansion at the expense of rangeland?			✓	
Will the project impede with pastoral mobility?			✓	
Does the intervention result in blocking migratory routes?			✓	
Will the project contribute to the degradation of Goz soils? (e.g. Through agricultural intensification on already depleted soils?)			✓	
Will the project increase intensification of pressure on rangeland?			✓	
SOCIAL				
Will the project be in a densely populated area?		✓		
Will the project lead to displacement of population?			✓	
Will the project lead to significant population density increases, affecting environmental sustainability?		✓		
Will the project lead to an increase in population movement?		✓		
Will the project lead to an increase in HIV/AIDS transmission?			✓	
Will the project be located in or close to a site of high natural or cultural value?		✓		
Is the project located in a conflict area?	✓			Provision of enough services beside even distribution of services over the region to avoid conflict of interest over the use of the available energy services. Besides avoiding exclusion of groups in the community through participatory assessment of needs to meet the special needs of the different groups.
Will the project negatively impact prevailing land tenure arrangements?			✓	