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United Nations Development Programme

Country: Mauritania

PROJECT DOCUMENT

Project Title: Promoting Sustainable Mini-grids in Mauritanian provinces through hybrid technologies

UNDP Strategic Plan Focus Area: Output 1.3: Inclusive and sustainable solutions adopted to achieve increased energy efficiency and universal modern energy access (especially off-grid sources of renewable energy).

UNDAF Outcome(s) 2012 - 2016: Outcome 1 National institutions, local and civil society are able to exercise good environmental governance and economic valuation of natural resources taking into account climate change.

Expected CPAP Output (s)

From CPAP component 3: Improving environmental governance and rational use of natural resources

Executing Entity/Implementing Partner: Ministry of Environment & Sustainable Development / APAUS

Implementing Entity/Responsible Partners: United Nations Development Programme

Brief Project Description:

Objectives of the Project: The objective of the project is to optimize existing mini-grids in Mauritania by increasing the share of Renewable Energy (RE) and developing an appropriate business model for the sustainability of the hybrid system. This project is well aligned with: i) the Mauritanian Government's efforts to promote energy access and promote clean energies; and ii) the country's Poverty Reduction Strategy Paper III (PRSP 2011-2015) goals to increase the share of renewables in national electricity generation and energy access.

Overcoming Barriers: This project seeks to overcome the regulatory, institutional, technical, financial and social barriers for the promotion of hybrid renewable mini-grids in Mauritania by:

1. Creating an enabling environment to attract private sector participation through the creation of policy, regulatory, legislative and financial de-risking instruments for hybrid based mini-grid (diesel/RE) development;
2. Building the necessary capacity to operate, manage and maintain hybrid mini-grid systems in country through the publication of guidebooks, on-the-job capacity building, the provision of business and technical advisory services to the national utility and hybrid mini-grid developers and the provision of tailored capacity building to relevant national agencies;
3. Showcasing a viable hybrid mini-grid business model

Management of Project: Implemented using UNDP NIM modality

UNDAF Programme Period:	2012-2016	Total resources:	8,920,142 USD
Atlas Award ID:	tbd	<i>Regular:</i>	
Project ID :	tbd	- GEF	1,270,142 USD
PIMS#	5357	- UNDP (TRAC)	400,000 USD
Start Date:	April 2016	<i>Other:</i>	
End Date:	March 2020	* Government	2,250,000 USD
PAC Meeting Date:	tbd	* Donor (IRENA/ADFD)	5,000,000 USD
Management Arrangements	NIM		

Agreed by (Government):

Date/Month/Year

Agreed by (Executing Entity/Implementing Partner):

Date/Month/Year

Agreed by (UNDP):

Date/Month/Year

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+ List of acronyms + List of annexes

Acronyms and abbreviations

AfDB	African Development Bank
ADER	Rural Electrification Development Agency
AEP	Drinking Water Supply
ANADER	National Agency for the Development of Renewable Energy
APAUS	Agency for the Promotion of Universal Access to Basic Services
ARM	Multisectoral Regulation Authority
CILSS	Permanent Interstate Committee for Drought Control in the Sahel
COMELEC	Maghreb Electricity Committee
CRAER	Centre for Applied Research in Renewable Energy (University of Nouakchott)
DEME	Directorate of Electricity and Energy Control
DFI	Development Finance Institutions
DSP	Delegated Service Provider
DSPE	Delegation of Public Electricity Service
ECOWAS	Economic Community of West African States
ECREEE	Energy Centre for Renewable Energy and Energy Efficiency
EF	ACP-EU Energy Facility
FADES	Arab Fund for Economic and Social Development
FAUS	Funds for Universal Access to Services.
FFEM	French Fund for the Global Environment
FID	Islamic Development Fund
GDP	Gross Domestic Product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GNP	Gross National Product
GRET	Group for Research and Technological Exchanges
HDI	Human Development Index
HFO	Heavy Fuel Oil
HIPC	Heavily Indebted Poor Country
IFI	International Financial Institutions
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
ISET	Higher Institute of Technological Education
ITC	Institute of Technology of the Canary Islands
MAED	Ministry of Economic Affairs and Development (Affaires Economiques et Développement)
MENA	Middle East North Africa
MPEM	Ministry of Petroleum, Energy and Mines
MWp	Mega Watt peak, the peak capacity of solar projects (capacity of panels)
OFID	OPEC Fund for International Development
O, M & M	Operation, Maintenance and Management
OMVS	Organisation for the Development of the Senegal River
PPP	Public Private Partnership
PRS	Regional Solar Programme
PRSP	Poverty Reduction Strategy Paper
RE	Renewable Energy
SNIM	National mining company (Société Nationale Industrielle et Minière)
SPEG	Company for the Production of Electricity from Gas
UMA	Arab Maghreb Union
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
USTM	University of Science (Université des Sciences et Techniques de Mauritanie)
WAPP	Western African Power Pool

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1. SITUATION ANALYSIS

1.1 Context

Mauritania is a large, 1,030,000 km² semi-arid country with a population of 3,357 million people (2013 census), 60% of which is under the age of 25. A little over 41% of the population lives in urban areas with an increase in urbanization of 2,91% per year. In 2012, the Gross Domestic Product (GDP) per person was 1,247 USD and estimated at 1,191 USD in 2013. It is estimated that approximately 20% of the population live on less than \$1.25 per day.

Figure 1: Map of Mauritania



The main economic activities include extractive industries¹, fishing and agriculture. In terms of percentage of GDP, industrial activities represent 48%, services represent 37% and agriculture - including fishing- represent 10% of GDP. While in terms of employment the balance is inverted

¹ Extractive industries include all activities related to mining and oil and gas extraction.

with 50% of the active population in the agriculture and fisheries sector, 40% in the services sector and 10% in the industrial sector.

Exported resources boost the country's economy but also expose it to external commodity price variations. In 2011, extractive industries provided approximately 38% of total country revenues (excluding foreign development aid) up from 24% of revenues in 2010 (with a balance of 83% provided by mining activities and 17% by oil and gas). On the other hand, fossil fuel imports cost 545,5 million USD in 2008 in comparison to total revenues of 1 627 million USD, of which 326 million USD came from crude oil exports.

These numbers help to better understand to what extent the country is exposed to commodity price variations. This was highlighted in a recent IMF analysis of the country's economy: "*a number of risks that can potentially negatively affect the countries growth perspectives remain, exposing it to a negative evolution of exchange terms. One of the absolute priorities is to reduce the economy's exposure to external price variations*"². The Mauritanian economy will remain exposed to commodity price variations for its export revenues, but it can help to reduce price risks by increasing its use of domestic resources for energy needs. The country has already acknowledged this situation in its national policies by encouraging the use of domestic resources for its energy needs, starting with the use of domestic gas for electricity production as well as the promotion of renewable energy resources.

For 2012 Net entropic emissions of GHG were evaluated at 7070,544 Gg Eq-CO₂ equivalent to 2.1 tons eq-CO₂/person³. Of these, CH₄ represents 68% of direct emissions (almost exclusively from cattle) and CO₂ represents 31% of emissions (transport 30%, energy 20%, industry 14%, residential 12%, land use 6%). Between 1990 and 2012 CO₂ emissions increased by 517%, mainly due to the energy industry.

1.2 Energy Situation in Mauritania

Mauritania has a wealth of energy sources, be they fossil or renewable. Oil and gas reserves are not yet fully measured due to their recent exploitation and exploration. In terms of renewables, solar and wind resources are predominant within the country, while large hydro resources are tapped through the OMVS (Organisation de Mise en Valeur du Fleuve Sénégal)

However, to date, the country is almost exclusively dependent on imported energy sources. This is why the country has actively promoted the development and use of indigenous energy sources. For the moment, only a portion of the population has access to modern energy services with 64% of the country's primary energy consumption ensured by traditional biomass. Overall, a little over 24% of the population has access to electricity with 60% of the population in urban areas and 5% of the rural population⁴. Electricity demand itself is growing by 10% per year, mainly led by industry needs which represent more than half of total consumption.

² : *Sixth Review of the Three-Year Arrangement Under the Extended Credit Facility and Request for Waiver for breach of a performance criterion*; IMF; 31 May 2013.

³ : Third National Communication on Climate Change, MEDD, July 2014

⁴ In 2011, 41,5% of the population lived in urban zones with urbanization increasing at a rythm of 2,91% per year. (World Factbook, Mauritania, Central Intelligence Agency (CIA), 2011)

Resources

Fossil fuels

Apart from mineral resources, Mauritania boasts oil and gas reserves, the full extent of which remains unknown, but which are large enough to be commercially exploited. The "Western African Resource Watch" has estimated the country's oil reserves at 1 billion barrels, which would put Mauritania just behind Nigeria. But investors have recently been disappointed with the results of operations. Oil fields such as Chinguetti, exclusively used for export, saw output fall from 70,000 bbl/d in 2006 to 6,143 bbl/d in 2013. This uncertainty in terms of production may be partly due to the fact that the full extent of these resources is unknown. Indeed, to date the country is still under-explored, with just 1.7 wells per 10,000 km² in the licensed areas compared to an average of 50 wells (Zawya 2013). Since the Mauritanian oil basin is still poorly measured, it is likely that these figures will increase in the short term depending on the results of ongoing exploration and the use of new and more advanced exploration technologies and operating resources.

The Banda Gas field, whose reserves are estimated at 1.2 Tcf⁵, is forecasted to enter production by 2017. The gas reserves will be used to directly produce what is expected to be low-cost electricity for the grid. However, recent changes in the architecture of the project (abandoning the initially planned framework of building a jointly owned company with mining industry operators), risk delaying electricity production from gas. As the first power plant of this project has already been built (120 MW dual-power plant), it is being run on fuel oil until the Banda gas field is in production.

RE potential

Mauritania is part of the OMVS (Organisation pour la Mise en Valeur du Fleuve Senegal) and participates in the projects that are planned and implemented within this framework. Mauritania currently has 30 MW of the capacity of the Manantali hydro dam, and 18 MW of the hydro Felou dam. Two additional dams, Gouina and Gourbassi are planned to be completed by 2020.

Mauritania has significant renewable energy resources. Solar resources of 1900-2300 kWh/m²/year, the lowest radiation being on par with the highest resources in southern Europe, are quite substantial in comparison to many other countries where photovoltaic electricity production is increasingly becoming competitive with mainstream energy sources. Current data mainly comes from satellite measurements that must be completed with ground level measurement series to get a better estimate. A number of pilot projects and measures launched in the 1990s could be used to refine the data, but this data is often not available or usable. In any event, existing data and production from installed PV plants allows to gauge the extent of solar potential in the country.

In the case of wind resources, the values are just as high, but more localized around coastal areas with a peak of more than 9 m/s winds in the Nouadhibou region. In the northernmost coastal areas, wind speeds of between 8.3 and 8.7 m / s have been measured. Values drop gradually further south but they remain above 7 m / s along the coast. These values are quite high in absolute terms, showing a good potential in coastal areas. It is more difficult to establish wind patterns inland, since they are affected by topography and specific conditions related to the sites.

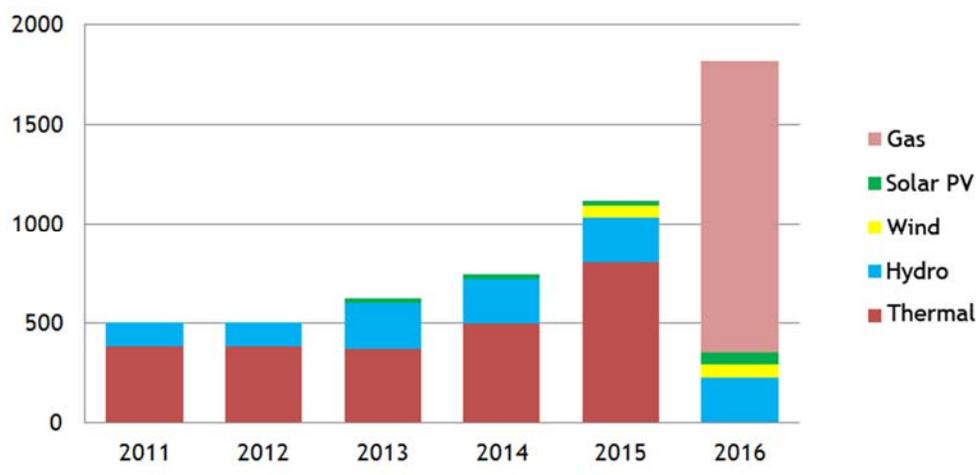
⁵ Source: MPEM

Biomass resources are more limited due to the country's semi-arid environment. Cultivable land represents approximately 0,44% of the country's total surface, while the proportion of land being used for agriculture represents 0,01% of the total. These areas are concentrated in the south of the country, along the Senegal.

Demand

Annual primary energy consumption in the country was estimated at 4.8 million barrels of oil equivalent in 2010 (eia). Annual consumption per capita is 0.3 toe (GTZ 2009), and 0.17 toe without traditional biomass. Mauritania's energy mix is composed of approximately 67% biomass (wood and charcoal), followed by petroleum products. In other words, petroleum products account for the vast majority of commercial energy used in the country.

Figure 2: Energy production in GWh/year by type of energy (planned from 2015)*



*Up to 2015, thermal production capacity is ensured by HFO and Diesel

Source: APAUS

Electrical consumption is increasing by more than 10% per year, while less than 5% of the population in rural areas has access to electricity⁶. Electricity demand (including national network and mining) is forecasted⁷ to grow from 411 MW in 2013 to between 840 MW and 1,400 MW in 2025 (in the "low" and "high growth" scenarios) It should be noted that 75% of this capacity is related to mining sector energy demand (1,050 MW in 2025), rendering the growth scenario very sensitive to mining industry growth.

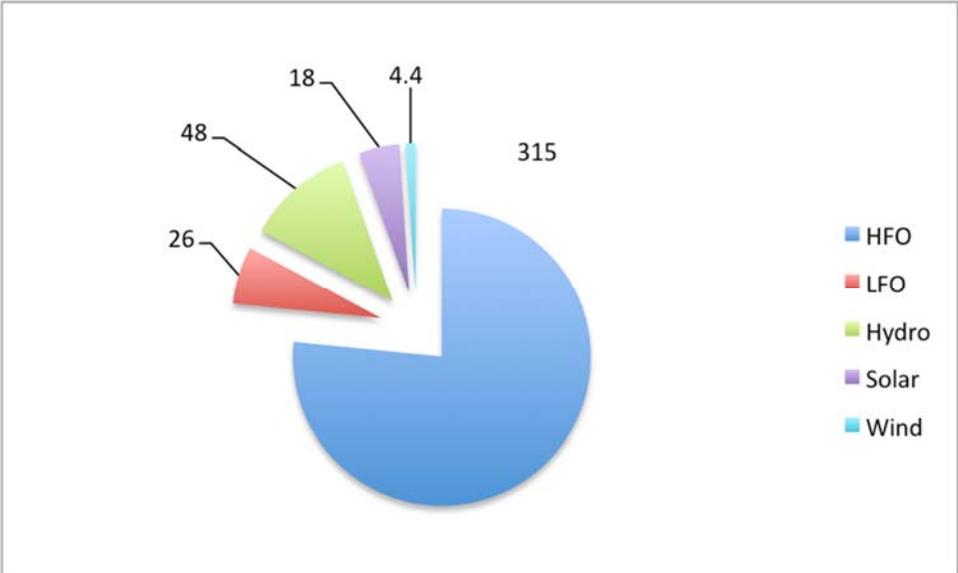
⁶ EIA 2013: *Mauritania country profile*; US Energy Information Administration; 2013; <http://www.eia.gov/countries/country-data.cfm?fips=MR#pet>

⁷ INTEC 2012 : *Master Plan for the Production and Transport of Electrical Energy in Mauritania between 2011 and 2030*, intec; November 2012

Electricity capacity and tariffs

The total installed electric capacity in Mauritania reaches 411 MW (on and off-grid). This includes 48 MW of hydropower, 18 MW of PV, 4,4 MW of wind power. However, several on-going renewable projects will increase the renewable share. 30 MW of wind power are installed and should be in production in second half of 2015, while 30 MW of PV have been funded and should reach the construction stage in 2015.

Figure 3: Installed electricity in 2014 (MW) (Somelec, Delegated Services Providers, Mining companies)



Source: MPEM

Electricity tariffs can be split in two different categories. On one side, the national utility, SOMELEC serves on-grid and major of-grid markets (namely regional capitals, Moughatas), on the other, Delegated Service Providers serve the off-grid markets. Electricity tariffs are set by MPEM decree. In the case of DSPs, maximum tariffs are set by the Multi-sectoral Regulatory Authority (MRA) under MPEM decree. Within the call for proposals to cover an off-grid area, DSPs propose a tariff. The MRA then assesses the necessary subsidy to be granted to DSPs on a quarterly basis. These grants are taken from the Universal Access Fund (FAUS), which is funded by taxes on telecommunication operators as well as state funds. The fund itself is managed by APAUS, the agency for universal access (covering electricity, water and telecommunications).

Table 1: Existing fees for on and off grid electricity

On grid and off grid SOMELEC	Off-grid (DSPs)		
	Social rate <25 kWh / month	Medium rate Between 25 kWh and 120 kWh	Higher rate >120 kWh / month
Fixed premium: 1,13 USD Energy prices: <2 kVA: 0,106 USD /kWh > 2 kVA: 0.203 USD/kWh	Fixed premium 2.06 USD Energy price 0.175 USD/kWh	Fixed premium: 5.58 USD Energy price 0.278 USD/kWh	Fixed premium: 25.82 USD Energy price 0.309 USD/kWh

Source: SOMELEC Rates Study;

"Joint Order 2418, MHE MCI fixing the maximum retail prices of electricity in locations subject to delegation by the public electricity service, 23 June 2008";

1 Ouguiya = 0.00343643 USD

The tariff differential between off-grid clients is significant. In rural areas, the equivalent of social rates can almost double -from 10.6 USD cents to 17,5 USD cents/kWh-, depending if clients are served by SOMELEC or DSPs. However, SOMELEC's current rates do not allow the company to extend its service provision. In 2013 SOMELEC's balancing subsidy was 20 million USD for 180 000 clients (111 USD/client), while the operating subsidy for DSPs reached a little under 1.5 million USD for 6 000 clients (250 USD/client).

Average costs of on-grid production were estimated to reach 0.16 USD/kWh in 2014⁸. SOMELEC forecasts production costs to decrease to 0.10 USD/kWh when the Banda Gas will become available. However, the 120 MW dual Gas-Fuel Oil plant built to use the gas will continue functioning with fuel-oil until the gas is exploited, increasing production costs significantly. On-grid wind power is expected to cost between 0.07 and 0.10 USD/kWh⁹ (respectively 9 m/s and 7 m/s wind speeds). Obviously, the ultimate cost of production is highly dependent on the cost of financing, capital costs being one of the more significant elements of renewable energy production costs.

Off-grid production costs are significantly higher. Electricity produced on mini-grids is estimated at an average of 0,54 USD/kWh. While an average world-level price for hybrid diesel-renewable (PV or Wind) mini-grids is estimated to be 0.4 USD/kWh without subsidies¹⁰. This helps to better understand to what extent increased hybridisation of mini-grids in rural areas of Mauritania can help to decrease the ultimate cost of providing off-grid energy services.

⁸ Source: APAUS/MPPEM

⁹ Study on the master plan on the generation and transport of electric power in Mauritania (Horizon 2011-2030), Tractebel Engineering, 2010.

¹⁰ Hybrid Mini-grids for Rural Electrification: Lessons Learned; Alliance for Rural Electrification (ARE); 2011. And Hybrid Power Systems; IRENA; 2013

1.3 Situation Analysis of the Use of Mini-grids and RE

The rate of access to electricity¹¹ is quite low in the country, partly due to the difficulty of extending the network and to the scattered nature of demand, which makes interconnection difficult. Overall, it is estimated that the number of households connected to the grid progressed from 22% in 2000 to 24% in 2004 and 34% in 2013.

Table 2: Rate of access to electricity (2013)

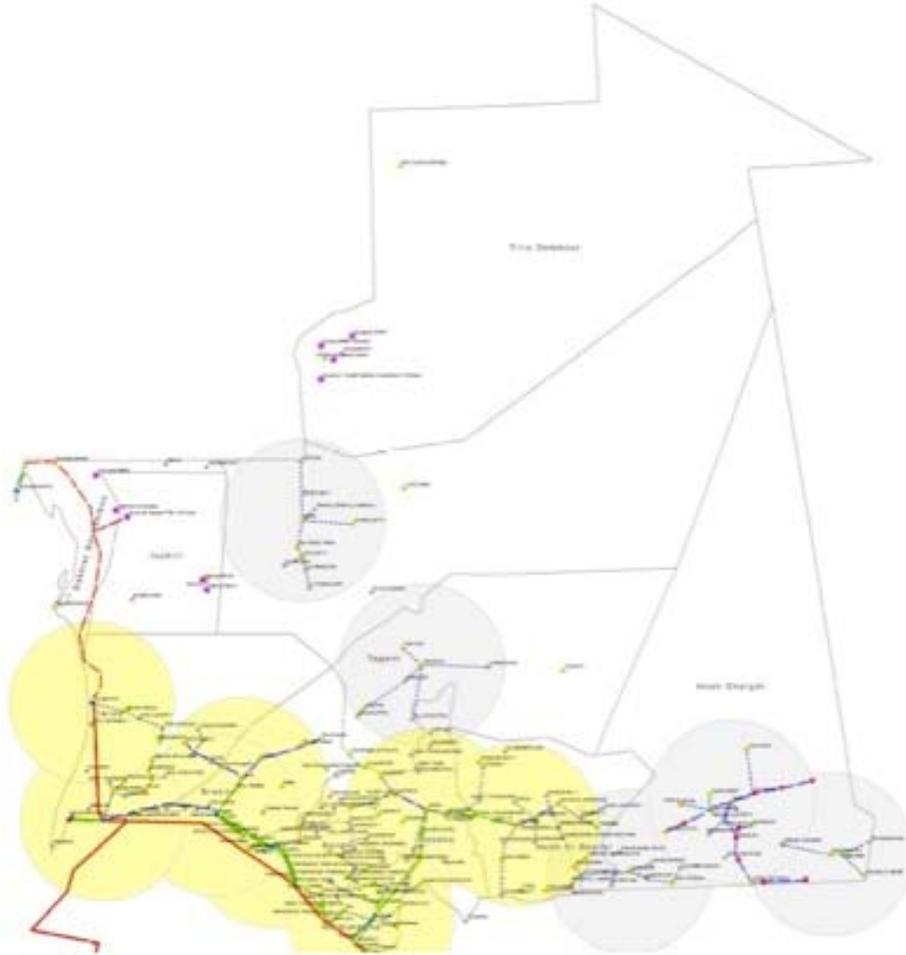
National access rates	34 %
Urban	58 %
Rural	5%
Nouakchott	70 %
Nouadhibou	68 %

Source: MPEM

In order to overcome these disadvantages, the "Master Plan of production and transport of electrical energy in Mauritania" is considering an extension of the network from the main consumption centres. Connection areas within a radius of 120 km around the point of generation / interconnection are defined to measure the potential of connection to the network / mini-grid. Some of these areas could be directly connected to the national grid, others powered from solar hybrid /diesel power / (Kiffa being one of the first areas covered by hybrid production and a 33 kV network).

¹¹ This is the ratio between the number of households covered and the total number of households in the area or district.

Figure 4: Electrical Network in Mauritania and potential mini-grids



Beyond the implementation of large-scale mini-grids (such as Kiffa, that has a combined capacity of 1.3 MW from Solar PV and 4.8 MW from diesel generators), the country has also promoted the development of smaller mini-grids for rural communities for many years. The first renewable energy-based mini-grids were experimented in the mid-1990s with the Alyzès program (one of the first UNDP-GEF projects initiated in the country), based on simple mechanical wind-turbines. Moreover, until recently most of the mini-grid applications were based on diesel generators. In this vein, all of the regional capitals (Wilayas and Mouqhataas) are served with diesel generators and mini-grids. The Multi-Functional Platform (MFP) model has also widely been used throughout the country to improve access to energy services.

Many of these mini-grids are managed and partially maintained by delegated service operators (DSPE). An institutional system is in place for the selection, management, financing and verification of delegated service operators. The Multisectoral Regulatory Agency –ARM- (Agence de Régulation Multisectorielle) is responsible for managing the DSPEs and allocating funds from the Universal Access Fund FAUS (Fonds d'Accès Universel aux Services)¹². For each service

¹² L'ordonnance n° 2001- 06 , 27 June 2001: creating the FAUS and APAUS, the agency in charge of implementing

area, the delegations apply tariffs set by the ARM under MPEM Decree. The Multisectoral Regulatory Authority (MRA) assesses the subsidy granted to each DSPE on a quarterly basis. This grant is taken from the Universal Access Fund (FAUS) managed by the APAUS. Thus, the State, through the MRA and via the APAUS (FAUS) issues the quarterly operating subsidies required to ensure the economic sustainability of the delegations.

Beyond the existence of a regulatory and financial architecture for the development of mini-grids, the country has also been exploring the promotion of renewable and hybrid-based mini-grid development. As previously indicated, the first renewable-based mini-grids were implemented in the mid-1990s based on wind. Moreover, NGOs and national agencies (APAUS, ADER) have been promoting the development of renewable based mini-grids on a similar model to the MFP but based on solar energy. A joint GRET (Groupe de Recherche et d'Echange Technologique – NGO-) and APAUS project funded by the EU energy facility, (EF) PERUB, installed 24 solar-based MFP projects between 2008 and 2011, 24 other solar platforms were installed through a joint UNDP/USAID/APAUS project and 6 others by APAUS. Another project, ERUDI, based on EF funding, is installing 100 additional solar platforms between 2011 and 2015.

Mauritania has implemented the necessary legal, regulatory and financial structure to promote the development of hybrid renewable minigrids. However, many issues still remain to be solved, including the definition of a sustainable infrastructure to promote these projects and defining a sustainable financial mechanism. Until now, most of these projects have been implemented on an ad-hoc basis. Despite an existing will to promote hybrid mini-grids, the State is limited by the availability of funds and the development of a sustainable environment for their expansion.

1.4 Survey of Industries Using RE

Renewable energy use is relatively widespread in Mauritania although not yet mainstream. Renewable energy based applications have been implemented based on needs. As the country is relatively large with dispersed populations and economic activities, the country has not been able to develop the electricity network to serve all industry and population needs. Renewable energy applications have progressively been adopted within the country based on their respective values and benefits.

Initial renewable energy uptake concerned off-grid solar and wind applications for rural population needs. The spread of applications run from individual solar kits for homeowners to mini-networks and solar platforms. Many Development Finance Institution (DFI) programmes and projects have promoted and directly invested in renewable energy applications in Mauritania. International NGOs based in the country have a significant experience in this area.

As renewables have become increasingly competitive with mainstream fossil fuel applications, industries in Mauritania have progressively adopted them. This is namely the case of the telecom sector that has embraced photovoltaic generation for cell-phone repeater tower energy needs. Extractive industries, one of the main economic forces within the country, are increasingly adopting solar and wind solutions for their small off-grid needs. Their success in this area and

the FAUS. The FAUS funds are replenished based on a levy on national telecommunications companies, on license fees for electricity market operators and multilateral funds.

their exposure to fossil fuel price swings is also increasingly pushing them towards the hybridisation of their off-grid power generation. For the moment, only the national mining company –SNIM—has initiated several renewable projects (4,4 MW wind project in Nouakchott, 3 MW PV project in Zoueratt) aimed at diversifying their power supply and decreasing their fossil fuel dependence. However, many other mining companies present in the country are considering the use of renewables to diversify their supply and reduce costs.

Mauritania's government and national agencies are also very active in the promotion and implementation of renewable energy applications. One of the reasons for this being the increasing price of fossil fuel imports in the national balance of payments and variable commodity prices that affect the country's ability to develop. This has resulted in the inauguration of some of the first large-scale renewable energy projects in the country (the 15 MW Nouakchott PV project inaugurated in 2014 and the 30 MW wind farm project in Nouakchott to be inaugurated in 2015). Several other projects are planned in the short and medium term, the most advanced being an additional 30 MW PV plant near/in Nouakchott.

1.5 Baseline Scenario

Policies

In the past few years, the Government of Mauritania has been quite active in increasing modern energy access and the promotion of clean energies. This includes the enactment of several legal acts, among them: (i) an electrical code (intended to liberalize the electricity sector); (ii) a law establishing a regulatory Authority; (iii) a law¹³ establishing the creation of a Universal Access Fund (Fonds d'Accès Universel FAU) mainly fueled by a tax levy on regulated sector operators, State and aid budgets; (iv) a law establishing the Agency for Promotion of Universal access to modern energy services (APAUS); (v) a decree creating the National Agency for the development of renewable energy and energy efficiency (ANADER)¹⁴ October 2010; (vi) a policy letter on rural electrification, outlining the actions of the Agency for Development of Rural Electrification (ADER). In addition, the Government created a climate change coordination unit (CCPNCC) in 2009 to organize and address nationwide climate change issues.

The overall mandate of APAUS is the reduction of social poverty by improving the living conditions, especially in areas with low attractiveness to private operators. The agency ensures the provision of basic services like water, electricity and telecommunication to rural and peri-urban areas. The core business model it operates under is one of public ownership of the assets with delegation of the operations to the private sector. APAUS manages the FAUS, a national fund for universal access to services. On the other hand, the mission of ADER is specific to the coordination and facilitation of decentralized rural electrification process. ADER is a private agency, but recognized by the Government as providing public services. ADER usually is a prime contractor for executing rural electrification programmes.

To better manage the isolated mini-grids in the provinces, the Government authorized the creation of hybrid mini-grids. This will help the Government to reduce its heavy subsidy towards the power

¹³ Loi réglementant les télécommunications (Law regulating telecommunications), 11 July 1999.

¹⁴ But ANADER was dissolved a few months after its creation, due to overlap mandates with other existing institutes such as APAUS and ADER.

utility company. In existing mini grids fully operating with diesel generators, the average commercial cost ranges from 90 to 160 UM/kWh (0.31 to 0.55 USD/kWh)¹⁵. But this is subsidized. Without any subsidy, the real cost is estimated to be on average 0.54 USD/kWh. On average at world level, the production cost of hybrid RE (solar PV or wind) / diesel-based mini-grids is estimated to be 0.4 USD/kWh, without any subsidy¹⁶.

Several initiatives on promoting renewable energies are initiated in Mauritania. Among them, a readiness assessment campaign and several hybrid energy generations that are subsumed as baseline for this GEF funded project.

Renewable Readiness Assessment (RRA):

In 2011, the International Renewable Energy Agency (IRENA) developed the Renewables Readiness Assessment (RRA) as "a comprehensive tool for assessing key conditions for renewable energy technology development and deployment in a country, and the actions necessary to further improve these conditions". Unlike other assessments, the RRA is a country-initiated, country-led process that identifies short- to medium-term actions for rapid deployment of renewables. There are four main phases in this assessment: (i) initiation and demonstration of intent; (ii) detailed country assessment and action plan; (iii) RRA validation and finalization; and (iv) follow up.

Mauritania initiated its RRA in 2012. It helped to provide an overview of RE potentials, and a list of current national RE initiatives in the country. Government officials, key stakeholders and actors were informed of the process during a workshop held in November 2013 where they were invited to identify and detail potential actions needed to enhance renewable energy deployment in the country.

The GEF funded project has been defined within the context of the RRA and will facilitate the initiation of several actions identified during the RRA.

Projects

Hybrid Wind Energy Project for 4 coastal Communities:

The project aims to improve access to electricity in four zones along the coastal area, towards the north of the country (near Nouadhibou). The four target localities are Lemcid, Lemhaijrat, Bellewakh, and Tiwillit. They are located in isolated areas far from any electrical grid. Wind energy was chosen due to the high potential on the Mauritanian coast, particularly in the targeted zones. The wind speed in that area is about 9 m/s.

The localities chosen are fishing villages, with important activities on fish conservation. Energy is needed for cooling and ice production. But energy is also needed for the production of drinking

¹⁵ Source: SOMELEC data in 2012

¹⁶ Hybrid Mini-Grids for Rural Electrification: Lessons Learned, Alliance for Rural Electrification (ARE), (2011). And Hybrid power systems, IRENA, (2013)

and potable water, through seawater desalination. Water is scarce in the targeted villages, located in the Sahara desert, and the only way to access potable water is by treating the seawater.

In each locality, the project intends to install wind turbines with a combined capacity of 270kW. These are small turbines, with mast heights of 11 to 15 meters. The total capacity to be installed in the 4 localities is about 1 MW of wind energy. This will be hybridized with the already existing 1 MW capacity generated from diesel generators. In addition to the power plant, the project will build transmission and distribution lines, constituting a mini-grid. The energy will be utilized mainly for lighting, cooling (fish) and seawater desalination.

The project was prepared by APAUS and submitted for financing to the Abu Dhabi Fund for Development (ADFD) it was pre-approved in January 2014. Funding is now available. The ADFD will provide 5 million USD in loans to the project. The final approval and availability of the loan will occur once the following criteria are met:

- Co-financing (the ADFD covers only 50% of the project cost, the rest needs to be co-financed);
- demonstration that the project will be well implemented, under an adequate legal environment;
- demonstration of the potential for replication.

The GEF funded project will help to secure this financing by (i) putting in place an enabling environment for the development of hybrid diesel/RE based mini-grids, (ii) developing a suitable business model and financial instruments of these hybrid mini-grids for viability and replication, (iii) and building partnerships for cofinancing. The GEF proposed project will also use the above-mentioned diesel/wind power mini-grids as a showcase of a new business model that will promote confidence, sustainability and replication.

Hybrid diesel/solar PV plant in Kiffa:

The project aims to improve access to electricity in Kiffa (third city of Mauritania in terms of population, 600 km south from Nouakchott), meet the needs of populations and economic activities, through the construction of a hybrid solar PV / thermal power plant.

The total capacity of the plant will be 6.1 MW: 1.3 MW from Solar PV and 4.8 MW from diesel generators. The actual electricity demand in that region is 2.1 MW, entirely produced from thermal sources. But that demand is expected to increase by 4.8 MW in 2017 and 6.7 MW in 2022.

The total budget of the project is 30 million USD, in which 19 million USD is dedicated to the construction of the hybrid plant. The remaining budget will be for the extension of the mini grid around the Kiffa region and a capacity building program to SOMELEC, the power utility, for a better management of the plant.

The budget is provided by AFD (French Development Agency) through a 25 million USD of concessional loan, and 5 million USD as grant, through the EU Energy Facility program.

The construction of the plant is expected to be completed by 2017, all contractors have been selected and construction should start in 2015.

Other hybrid plants¹⁷:

Besides the Kiffa project, there are many other smaller initiatives for hybrid diesel/RE (mainly solar PV) plants in provinces in Mauritania. But at this point, all lack secure funding, and are at a conceptual or feasibility study stage.

Table 2: Planned hybrid plants

Projects	Main stakeholder	Description
Néma and Adel Bagrou (East)	APAUS	Capacity: at NEMA: 6 MW (4MW thermal / 2 MW Solar PV); at Abel Bagrou: 3 MW (2MW thermal / 1 MW Solar PV) Budget: 68 million USD (to be secured) This projects aims to hybridize and increase the existing thermal plant to 9 MW, with an extension of the mini grid. The produced electricity is targeted mainly for households and water pumping.
Atar (North)	SOMELEC	Capacity: 4 MW (2MW thermal / 2 MW Solar PV) Budget: 22 million USD (to be secured) This projects aims to hybridize and increase the existing thermal plant to 4 MW.
Tidjikja (Centre)	SOMELEC	Capacity: 2 MW (1MW thermal / 1 MW Solar PV) Budget: 22 million USD (to be secured) This projects aims to hybridize and increase the existing thermal plant to 2 MW.
Aleg (South)	SOMELEC	Capacity: 4 MW (2MW thermal / 2 MW Solar PV) Budget: 22 million USD (to be secured) This projects aims to hybridize and increase the existing thermal plant to 4 MW.

Atar, Tidjikja and Nema are part of the “Spider centres” (*centres araignées*). The concept of spider centres was created to limit the unaffordable extension cost of the main grid. A spider centre supplies several localities that are linked to the center by a 33 kV Medium Voltage line. Electricity generation is made from diesel generators installed in the centre. Centres are managed either by SOMELEC or APAUS.

The above hybrid projects are promising, but most of the funding is not secured yet. The business model of these projects is not optimized, as it is either managed by the power utility, SOMELEC, at a highly subsidised cost, or managed by APAUS, through small, delegated service operators (private sector) with high electricity pricing. The proposed GEF funded project will help to sustain the hybrid mini grid concept, by introducing a better business model (public private partnerships) and favoring the replication. The project will enable large–scale replication by removing underlying policy, technical and financial barriers to investment and management of hybrid based mini-grids.

¹⁷ In addition to the listed hybrid diesel/RE projects, there are others that are entirely RE source production (not hybrid), such as the 15MW solar PV plant in Nouakchott with Masdar, the 3 MW solar PV plant in Zouerate with SNIM, the 15 MW wind power plant in Nouakchott, the 2.5 MW solar PV plant in Aftout with IBD. Etc... But these projects are not hybrid and do not have the same objective compared to the RE based hybrid projects in the provinces.

Beside the above listed hybrid projects focussing on provinces and second cities, there are other hybrid projects focussing on rural and remote areas, such as PERLE (Rural electrification program through renewable energy on a large scale). PERLE is a program that aims to improve access to rural electrification and its productive use through an optimum use of renewable energy in Mauritania. Among the objective of PERLE, is to establish 15 hybrid power plants, running with diesel and either Solar PV or Wind energy. However, the GEF proposed project would focus more on provinces or areas with tangible income generating activities where the innovative business model will be developed and demonstrated. Once the business model is fully functioning, it can in a second phase, be adapted for the rural areas, where the capacity and willingness to pay is lower.

Socio-Economic situation in the four villages

The four coastal villages are situated North of the capital, Nouakchott, and south of “Banc d’Arguin” national park (circled on map, figure 1). The permanent population on site is mostly composed of Imragen, a native and indigenous Mauritanian ethnic group. The Imragen, are traditional fisherman and descendants of the first populations in Mauritania. The following table provides some of the salient characteristics of each village.

Table 3: Target Villages, main information

Designation	Population (households)	Public Infrastructure	Boutiques	GPS Coordinates
M’Heijratt	230	1 Health centre 1 School 1 Mosque	15	N 19° 01’ 53” W 16° 13’ 56”
Tiwilitt	60	1 Health centre 1 School (closed)	1	N 18° 52’ 19” W 16° 10’ 22”
Lemcid	40	1 School 1 Mosque	5	N 18° 41’ 17” W 16° 08’ 15”
Bellewach	100	1 Health centre 1 School 1 Mosque Vocational training centre	10	N 18° 31’ 05” W 16° 04’ 20”

Economic activities in these four villages are almost exclusively directly or indirectly linked to fishing. Most of the transformation of the fishing product is realised by women’s cooperatives. There are between 2 and 5 women’s cooperatives¹⁸ in each village, composed of between 30-100 women each. These cooperatives take in charge the transformation (drying, scaling, filleting, production of fish oil) of the fish, producing local added value. Several species of fish are exploited, depending on the season.

¹⁸ Information collected during on-site mission

Table 4: Fishing Season

	J	F	M	A	M	J	J	A	S	O	N	D
Coubines		Orange bar							Orange bar			
Yellow Mullet	Red bar		Orange bar							Red bar		
Octopus						Yellow bar						

The population itself varies depending on the fishing season. Many itinerant fishermen are active in the region, mainly from neighbouring Senegal. During the strength of the fishing season, the populations in villages can almost double.

In addition to economic activities, the project inception mission was able to identify some of the major cost items for the four villages.

Table 5: Major expenses in villages

	Units/month, price per unit	Average Monthly Outlay (UM) ¹⁹
Per household		
Gas (cooking)	2-4 big gas cylinders 2-3 small gas cylinders	10 000 – 16 000
Lighting (candles/batteries)		7 000
Telephone charging	10-20 charges 100 UM/charge	2 000 – 4 500
Radio	6 batteries 100 UM/battery	600
Total		19 600 – 28 100 UM/month
Per Village		
Water	2-4 trucks 44 000 – 48 000 per 12m ³	96 000 – 480 000 UM/month

¹⁹ 1 USD = 290 UM

1.6 Institutional and Stakeholder Analysis

Mauritania's electricity sector is governed by the Electricity code, adopted in 2001²⁰. Although aimed at creating a liberalised electricity sector, SOMELEC, the electricity utility remains predominant within the sector.

Table 6: Organisation of the energy sector

REGULATING LAW (2001) Regulating electricity, water, telecommunications and postal services	MINISTRY in charge of ELECTRICITY Develops, implements and monitors the enforcement of policies, strategies and programmes in the field of Electricity.			
	ELECTRICAL CODE (2001) Governs the liberalisation of the generation, transmission, distribution and resale of electricity, subject to licensing under the control of the Regulatory Authority (2001).	SOMELEC CONTRACT PROGRAMME Intervenes in urban and rural areas (Moughataas)		
Regulating Authority -Enforces the Code -Approves tenders, oversees their launch, evaluates bids and awards the licenses and authorisations. -Draws up the specifications for public service delegation for electricity: -Determines the amount of compensation due to delegations (In 2010, 200 million MU)	APAUS Agency for Universal public access to regulated services Intervenes in rural areas	ADER Private law association created in 2000 recognised to be of public interest in 01 Intervenes in rural areas	INDEPENDENT PRODUCERS SNIM -Self producer Distribution :Zoueratt	
	-Construction of networks; -Thermal plants; -Large-scale maintenance for delegatee plants	-Solar kits -Thermal plants; --Hybridisation of plants; -Large-scale maintenance for delegatee plants	MCM Self producer	-Ensures the generation, transmission, distribution, purchase and sale of electricity in urban areas. -Currently manages 44 centres. -Rates administered: • 36.01 MU/kwh social; 60% of customers. 20% of revenue; • 59. MU/kWh -165,000 subscribers -Balancing subsidy in 2013: 6 billion MU
	6,000 subscribers / 20 centres / Rates: (1) 51 MU/kWh (2) 81 MU/kWh (3) 90 MU/kWh		TAZIAST Self producer	
			SPEG Network production SOMELEC: 40* SNIM: 26% Kinross KGP: 36%	

Ministry of Petroleum, Energy and Mines (MPEM): The ministry develops, implements and monitors the enforcement of policies, strategies and programmes in the field of electricity. The MPEM also provides the governance structures to supervise operational entities such as SOMELEC and ADER for the Department of Electricity DEME (APAUS falling under the Ministry of Economic Affairs and Development –MAED). In addition, a Sectoral Focal Point (SFP) has been created to cover Climate Change issues and ensure the interface with the Ministry of Environment and Sustainable Development (MEDD).

Multisectoral Regulation Authority (MRA): Established in 2001²¹, the MRA is responsible for the regulation of activities in the water, electricity, telecommunications, postal service sectors, and any other area for which it is made responsible. For now, in the field of electricity, it is only in

²⁰ Act 2001-19 Establishing the electricity code.

²¹ Law No. 2001-18 on the Multisectoral Regulation Authority

charge of delegated service operators and issuing production licences for non-SOMELEC entities (mining companies, etc.) as SOMELEC is not yet part of its scope.

Agency for the promotion of Universal Access to Basic Services (APAUS): in charge of access to water, energy, telecommunications / ICT, created in 2001²² APAUS is an independent body funded through diverse sources (in particular overseeing the management of the Fund for Universal Access to Services (FAUS) for the Government). It also manages the Universal Access Fund to regulated services that aims to gradually consolidate most of the resources used for the expansion and operation of these services. The APAUS conducts electrification and infrastructure development actions in rural villages, whilst being responsible for heavy maintenance of delegated service generators

Agency for the Development of Rural Electrification (ADER): ADER is a non-governmental association under the supervision of the MPEM which carries out rural electrification actions. Previously primarily invested in the distribution of photovoltaic kits, ADER is increasingly involved in mini-grid projects similar to APAUS.

Mauritanian Electricity Company (SOMELEC): set up in 2001 following the split of **SONELEC** (National Company of Water and Electricity) in view of liberalising the electricity sector. It is responsible for the generation, transport, distribution and sale of electricity in urban and suburban areas across the entire national territory. It is also in charge of the management of remote networks in Mouqhataas.

Mining Companies: Some of the Mining companies are active in the electrification of villages near their centres of operation. They are also increasingly considering the possibility of reducing their operating costs through the use of renewable energy to supplement their off-grid needs.

NGOs: A number of NGOs, including international ones such as the GRET, are involved in the sector. They provide both awareness and demonstration projects in the field of renewables, especially in rural areas.

Education and vocational training: Education and vocational training are an important factor for the advancement of the project. Senior education applicable to renewables is dispensed within the Mauritania “Ecole des Mines” as well as the university. Vocational training centres are maintained by the SOMELEC and SNIM while technical schools such as the ISET in Rosso and CSET in Nouakchott ensure basic electrician training.

During the project preparation all of the main actors were contacted and encouraged to participate in the definition of needs in order to ensure appropriation, in addition proposed activities cover some of the actions identified during the RRA process. As a result, the project will aim to use synergies from the planned capacity building activities to ensure the availability of specific, applicable training modules for the maintenance and installation of hybrid mini-grids. These training modules will be delivered at two different levels:

- One through the “école des métiers” of SOMELEC, the CSET and ISET (vocational training schools) to train electricians needed for basic management and maintenance of

²² Ordonnance ° 2001-06 establishing the Agency for the Promotion of Universal Access to Services

- mini-grids (training would be made available to non-SOMELEC personnel, namely those responsible for the project);
- The other through the University to train future engineers in the design, management and maintenance of these systems.

1.7 Problem Analysis

Legal, regulatory and institutional framework: Although the country has made great steps in implementing renewable energy projects and promoting the use of renewables for energy service access, the sector at large is not well organized. The country has led a “project-based” policy, leading to a great number of installations, but sometimes lacking in terms of the framework for development. Project coordination and prioritisation need to be developed in line with a national action plan and policy. Although the regulatory framework exists, for the moment, only Delegated Energy Service Providers (off-grid) and independent power producers are regulated. The national electricity company (SOMELEC), although active in rural capitals (provision of electricity for Mouqhataas), is not under the regulators’ control. In addition, no specific actions have been taken to ensure the transition from mini-grids to the national grid as the transmission and distribution network progress. There are no specific provisions to promote hybridisation of distributed generation networks and local generation as well as to ensure the promotion of these resources through additional incentives or even adapted financial incentives. Although national legislation does not prevent the promotion of renewable energy sources, it can be improved to include more incentives and provisions in line with their specific characteristics and needs. Institutional and human capacities are insufficient to support rural electrification based on hybrid power plants and need to be reinforced at all levels.

Technical barriers: The combination of power generation sources, using both a fossil fuel and RE for a hybrid system, will require qualified people to manage the system. SOMELEC is not used to manage hybrid systems in isolated areas, and therefore will need technical and engineering capacities to ensure optimal system design, installation and maintenance. The low quality and quantity of skilled and competent workers in the power sector increases the cost of RE operation due to the need to rely on expensive imported services even for basic repairs and maintenance. The overall management of the technical system will have a real influence on the lifetime of the system and its affordability to end-users. In addition, the experience acquired will need to be capitalized on in order to assist existing IPPs (mostly in the mining sector) and Delegated Energy Service Providers to progressively shift towards a similar model.

Sustainable O, M & M model: The lack of experience with, and demonstration of sustainable operation, maintenance and management (OM&M) of hybrid diesel/RE-based mini grids poses a significant barrier. Before any large-scale replication can take place, an O, M & M model has to be designed and tested in order to minimize the substantial transaction costs and prove economic and technical viability of solar PV and wind power operations in second cities of Mauritania. The key missing aspects of a sustainable O&M&M model, that have to be put in place are : (i) technical oversight over plant operations and responsibility for repairing faulty equipment such as cracked Solar panels; (ii) an efficient and effective tariff structure which adequately covers both start-up and O&M&M costs; (iii) a robust and effective financial management, billing and payment collection system; and (iv) community mobilization, customer relations and conflict resolution procedures (such as in case of illegal connections or theft), engagement of productive end-users, etc.

Financial and economic viability: Several constraints currently limit the financial and economic viability of diesel-based mini-grids in Mauritania. Financially, current diesel-based mini-grid operations need to be highly subsidised in order to sustain operations and allow proper maintenance and replacement of equipment. Using hybrid RE-diesel solutions for mini-grids will help to reduce costs that are mainly linked to fuel use. In addition, the provision of capacity building for proper maintenance and management of systems will help to decrease global project costs. Another issue concerns the difference in treatment between SOMELEC-supplied towns (Mougatas) where national on-grid tariffs are applied and DSP-supplied towns where tariffs are almost double. An economic study will help to highlight the constraints arising from this difference in treatment and propose solutions to balance some of the major barriers arising from this situation. The use of lower-cost RE-hybrid solutions will help to reduce tariffs applied by DSPs in their respective markets, decreasing the difference in treatment between SOMELEC and DSP supplied communes. In addition, the economic study of DSP tariffs and prospective funding sources for the global access fund will help to show the way forward in future reforms to help attain economic viability for energy access programmes in the country

Knowledge & Information: Knowledge and information constraints are widespread in Mauritania. However, the country has a long history of experience in renewable energy projects, especially in the context of access to energy services in rural areas. The project includes significant knowledge and information management actions, not only aiming to make available previous experiences and data collected, but also providing the basis for sustainable knowledge and information collection and dissemination. The creation of an observatory will help provide a platform for information collection and exchange. In an effort to avoid duplication and competition between public entities and agencies, the observatory will be based in the MPEM while its work will be managed and carried out in a collegial way. All of the participatory actors and entities will be included in the management structure while the analysis and collection of information will be led by the most relevant entities within the observatory. For example, interpretation of data will be led by the University and management of the measurement systems will be ensured by the National Meteorology Agency.

1.8 Rationale for Intervention

Mauritania has identified energy access as one of its main development priorities within its development targets. The challenge for Mauritania is to pursue its energy access targets without creating additional burdens on its national budget while optimising interventions in the sector.

The country has taken action through the definition and identification of priority projects and their implementation through all available development funding sources. This has led to a concrete “project-led” policy aiming to provide infrastructure investments wherever possible. These projects have been implemented through a diversity of actors present in the country. The main actors being the Agency for Universal Access (APAUS), SOMELEC and the NGO/Agency for the Development of Rural Electrification (ADER). They have been supported in their actions by numerous national and international NGOs present in the country. Mauritania also created a universal access fund (FAUS) aimed at providing basic water, energy and telecommunications needs for remote areas not covered by the network.

These actions have helped the country progress from 22% of access to electricity in 2000 to 24% in 2004 and 34% in 2013. However, access in rural areas is still low at 5% of the population. As a result, the financial burden of increased access has grown in similar proportions. In 2013, the subsidy for delegated service operators reached 430 million MRO²³ (1,5 m USD) and the balancing subsidy for SOMELEC reached 6 bn MRO (20 m USD). Funding will not be sufficient to continue efforts in reaching access targets if changes are not made.

Two areas of action have been identified by the country to reduce the cost of increasing energy access:

- Hybridization of mini-grids, using renewable energy sources to lower the burden of fossil fuel costs;
- Increasing the efficiency of interventions and ensuring optimal management and maintenance of hybrid mini-grids.

The proposed GEF-UNDP project, commonly called “Hybrid mini-grids” project will help to contribute to these needs by helping to demonstrate the viability of hybrid systems for remote uses; by helping to build the necessary legal, regulatory and financial systems and by promoting the necessary capacity building to help ensure the viability of these systems.

²³ MPEM

2. STRATEGY

2.1 Project Rationale and Policy Conformity

2.1.1 Alignment with National Aspirations

Poverty Reduction Strategy Paper (PRSP) 2011-2015: Energy has been directly identified as one of the priorities for the country's development. The strategy paper is aimed at accelerating economic growth, the basis for all poverty reduction, to improve the competitiveness of the economy and *reduce its dependence on external factors*. The second focal area is aimed at enhancing the growth potential and productivity of the poor. This involves the promotion of sectors that directly benefit the poor and areas with a high concentration of poverty, while the third area focuses on developing human resources and access to basic services. The current project addresses most of Mauritania's development priorities, helping to provide access to basic services to the poorest parts of the population while enhancing their growth potential and productivity through the provision of electricity services while reducing their exposure and dependence on external factors (i.e. fossil fuels). Furthermore, the PRSP includes a target whereby the proportion of renewable energy systems (RES) in electricity generation should rise to 15% in 2015 and 20% in 2020.

The project is in line with Objective 3 “promoting investment in renewable energy technologies” of the Climate Change Mitigation section of the GEF Focal Area Strategy. While the Second National Communication to the UNFCCC (2008) of Mauritania highlighted that the Energy sector is a significant contributor to GHG emissions representing some 14% of total GHG emissions for the country. The Second National Communication, as well as early results of the third national communication, identified renewable energy technologies as being able to play an important role in helping to reduce GHG emissions.

The project also covers a number of the priority actions identified in Mauritania's National Environment Action Plan (NEAP, Plan d'Action National Environnement)²⁴. It namely provides support to four out of six priorities identified within the NEAP. This includes poverty as a central problem to environmental degradation, human sustainable development including the environment, and the relation socio-economic development and the environment (actions within the project aiming to provide environmentally-friendly development solutions). The project also serves the aim of “diminishing the weight of public debt to facilitate the fight against poverty”, in effect, the reduction of imported fuel consumption will help to reduce the burden on national budgets.

2.1.2 Country Ownership and Eligibility

In recent years, the Government of Mauritania has undertaken several actions to promote modern energy service access and clean energies. Mauritania has clearly identified the access to basic services, including energy services, as one main elements of its national development policy. The

²⁴ *Rapport National sur le Développement Durable 2012 (2012-2016)*, MEDD

policy seeks to expand electricity distribution as soon as possible and to provide energy services independently where the network is not available. This access policy directly mentions the need to develop local or regional energy sources (gas and renewables) and to balance the renewable energy mix. It includes specific targets for electrification through the electrification of 108 villages in the 9 poorest Wilayas and support for collective and private initiatives in 192 local areas (villages with between 500 and 1200 inhabitants). The objectives of the PRSP and MDGs include an increase in the urban electrification rate from 50% to 80% by 2015 and a rural electrification rate increase from 5% to 40% by 2015.

The country has also enacted several legal acts in this vein, including an electrical code introducing the basis for a liberalized market with a regulator in charge of oversight (the ARM). More importantly, it has established a Universal Access Fund²⁵ (Fonds d'Accès Universel FAU) mainly fueled by a tax levy on regulated sector operators, State and aid budgets and an agency, the Agency for Promotion of Universal access to modern energy services (APAUS) to manage this fund and implement the projects. The Government also created in 2009, a climate change coordinating unit (CCPNCC) whose role is to coordinate and address nationwide climate change issues.

Moreover, the country has also implemented numerous projects within these policy goals, including a 15 MW PV plant in operation and a 30 MW wind farm in construction. More specifically in this case, the country is actively promoting access to energy services and hybridization of remote energy production mini-grids. In this vein, the Kiffa project aims to hybridize electricity production in remote areas with a 1,3 MWp PV field combined to a 4 MW fossil fuel plant. In addition, more than 52 solar-based multifunctional platforms have also been installed in remote villages through combined development funding sources and an additional 100 solar platforms should be installed in the short term through additional ACP-EU Energy Facility funding for the ERUDI project.

This GEF funded project will help to support several pillars of the United Nations Development Assistance Framework (UNDAF). This includes pillar 1 seeking to promote the fight against poverty and food security, through the creation of local economic activity and the increase of local added value as well as pillar 3 aiming to improve environmental governance and the rational use of natural resources.

2.2 Design Principles and Strategic Considerations

This project is designed to help demonstrate the viability of hybrid renewable-diesel mini-networks for remote access needs. It aims to demonstrate the technologies involved and how combining service provision (electricity, water, cooling/ice) to help create added value within the rural communities can ensure the maximum development impact while encouraging the necessary economic growth to allow populations to pay for the related services and necessary maintenance. This project will adopt a two-fold approach:

- Assisting to create and implement the necessary institutional and legislative package while encouraging an integrated approach to capacity building aimed at not only ensuring project maintenance, but also that future vocational training and technical education include the necessary elements;

²⁵ Loi réglementant les télécommunications (Law regulating telecommunications), 11 July 1999.

- Demonstrating the technology and an innovative combined utility-private sector business model for the management of hybrid mini-grids.

In addition, the project has been strongly anchored within existing country priorities, on-going programmes and plans. Elements of previously identified priorities (within the UNDP/IRENA RRA process) have been integrated within the original project design to maximise synergies. These elements, such as:

- the creation of a renewable energy observatory;
- centralized compilation of renewable energy data collected within implemented projects;
- collaboration with the university and vocational training schools to offer concrete training and ensure the sustainability of training afforded within renewable projects;
- the use of existing in-country capacity to help build local expertise;

Have been central to the development of the project.

In addition, partnerships outside of the project perimeter have been developed and pursued to ensure sustainability and replicability. For example, cooperation with the Small Grants Programme²⁶ is already envisaged to accompany the adoption of new techniques and added value activities. This will include assisting the target villages to:

- Adopt energy efficient solutions (equipment such as lighting, refrigeration, etc.);
- Make the best use of available energy in launching efficient productive, added value activities (fish transformation);
- Potentially combine a waste collection and reuse action to encourage the development of local agricultural produce (much of the waste being linked to fish remains).

Accompanying local development potential linked to the provision of energy services is one area where many development projects have lacked. The lack of this type of accompanying action can explain the lag in energy use in newly equipped villages. The SGP contribution will be key in this area.

2.2.1 Description of Components

The Program consists of the following three components:

- Policy, regulatory, legislative and financial instruments for hybrid based mini-grids (diesel/RE) development
- Capacity Building for hybrid mini-grid system management
- Showcasing a viable hybrid mini-grid business model

Component 1: Policy, regulatory, legislative and financial instruments for hybrid based mini-grids development

This component will enable the development of hybrid mini-grids, by facilitating the increased share of renewable energies in the already existing and future planned mini-grids. The power utility SOMELEC, APAUS, and other private and independent power producers, will benefit from

²⁶ The Small Grants Programme in Mauritania has namely focused its GEF6 programming on “Low-Carbon Energy Access Co-benefits” in order to contribute to satisfying global demand for energy services for people without access to electricity. In line with the Sustainable Energy for All (SE4ALL) framework, the programme will focus on providing bottom-up, low-cost energy solutions with a high carbon emission reduction potential.

this legislation. A new business model will be promoted in the management of these hybrid mini grids. The power utility business model will be the basis of the business model, but with broader partnerships such as public and private partnerships, to enable the private sector to be involved while reducing the investment load of the power utility.

Basically, the policy framework will promote a “hybrid” business model, combining the utility business model and the private sector business model. Each of these business models has its advantages and disadvantages, so combining the two will be more relevant and sustainable.

According to the World Bank, utilities are the most common driver for rural electrification in developing countries. The principal advantage of the utility model is that the primary responsibility lies with an experienced party with the financial resources and technical capabilities to implement and manage the project. Utilities have a privileged position and can easily have better access to financial mechanisms. Some experts consider that this model is more likely to be successful because of economies of scope and scale that utilities can generate, but also in the light of their access to financing²⁷. However, utilities can have a top down approach that is not suitable to local circumstances and may lose ownership and willingness to pay from local communities. Utilities are also usually driven by political agendas, and may follow a demonstration approach, by doing an upfront investment in rural areas, without proper maintenance. This usually leads to a quick failure of the mini-grid. In the case of Mauritania, the utility does not have access to sufficient financing, being in chronic deficit due to tariff levels and lack of reform. While it can access funding through state guarantees, Mauritania itself is not in a position to raise debt as it is still in a transient HIPC (Highly Indebted Poor Country) status.

The private sector based model is the ideal option. But investing in rural areas presents a high risk that most of the private companies cannot afford. The capacity of payment in the provinces is low. But if well established, the private sector model has the advantage to be sustainable, as driven by profit. But this model leads usually to higher electricity pricing, that customers cannot afford.

The hybrid model²⁸, what is proposed in this project, will be a combination of the utility and private sector models. This will be done mainly through public private partnerships. For example, the utility can invest in the mini-grids installations, while a local private company is responsible for the overall daily management, maintenance and operating. This kind of arrangement will certainly lower the O&M&M costs. APAUS has already experienced some kind of cooperation with delegated service operators that can be compared to a small-scale public private partnership. The lessons learned from this cooperation will feed the development of the new business model.

This component will help to design policy instruments for long term viable hybrid mini grids, while developing some financial instruments Output-based aid (OBA) scheme²⁹, long term concessions,

²⁷ Hybrid Mini-Grids for Rural Electrification: Lessons Learned, Alliance for Rural Electrification (ARE), (2011)

²⁸ Hybrid usually refers to the energy source of the mini grids. But here particularly, when associated with business model, it refers to the combination of 2 traditional business models: the power utility business model and the private sector business model.

²⁹ The Output Based Aid (OBA) mechanism was modified to exclusively focus on design and planning of improved instruments. As Mauritania already has a functioning universal access fund, the priority has been put on better design and planning rather than actual investment. Investment-related funds were transferred to the subsidization of the equipment in component 3.

appropriate tariff for hybrid-mini grid) to have the involvement of the private sector. The output based aid and the long-term concessions for example, will help to attract the private sector.

Component 2: Capacity Building for hybrid mini-grid system management

This component will address technical barriers to the implementation of hybrid mini-grids. The aim is to help the power utility SOMELEC, APAUS and potential service providers upgrade their capacity for delivering turnkey solutions for hybrid systems. Technical assistance will be provided to a number of competitively selected local SMEs through an open Tender or Call for Expression of Interest for the provision of solar and wind power equipments. An international technology transfer partner (an experienced renewable energy company) will be sub-contracted to deliver such assistance. In addition, the project will provide training courses to system designers (university/SOMELEC, etc...) and end-users, develop and publish guides on design, installation and maintenance of hybrid systems. Confidence and capacity building of private sector investors will be conducted. Also, community organizations in pilot locations (local NGOs and SMEs/productive users) will be provided with assistance and advice on the relevant aspects of wind and solar PV operations, such as identification of potential sites, pre-feasibility assessment and business planning. Key stakeholders in the governments, relevant civil servants, and selected national agencies will also benefit from the capacity building.

Component 3: Showcasing a viable hybrid mini-grid business model

The expected outcome from this component is the improved confidence of communities, developers, the power utility and potential investors in the technical and economic viability of hybrid-based mini-grid plants.

The showcase will consist of supporting the hybrid diesel/wind power plant project in 4 coastal zones, by putting in place a suitable business model that allows confidence, sustainability and replication. If successful, the project will favor similar initiatives and induce other hybrid plants to secure funding and partners. The showcase will result to the effective installation of 1 MW wind power.

The showcase will be implemented in conjunction with financial instruments and OBA scheme to be designed under Component 1. The showcase (entire Component 3) will demonstrate the financial viability of the proposed business model. Financial viability of hybrid mini-grids will be addressed by introducing a cost-recovery tariff system (Output 1.2) supplemented by output-based aid (OBA) scheme (Output 1.3)

Cost-reflective tariffs: Permitting cost recovery and cost-based tariffs is essential to enabling the power utility and private sector entities to operate hybrid mini-grid systems. These developers have no ability to cross-subsidize electricity rates and must demonstrate financial viability to obtain financing. The key challenge and task here is to set the mini-grid tariffs at the right level that balance profitability of investment, on one side, with affordability of service for consumers, on the other side.

OBA scheme: While cost-recovery tariff structure is essential to ensure commercial viability of the service providers for hybrid mini-grid systems, in practice, it is usually unrealistic to expect full

cost-recovery tariff, given the low ability to pay in provinces. Worldwide, almost all rural electrification programs, in developing and developed countries alike, involve some form of public subsidies. Therefore, OBA scheme is proposed as additional financial incentive to service providers in the situations when application of financially viable tariff is not feasible.

All in all, the combination of two instruments, market tariffs and OBA scheme is seen as the most suitable choice of instruments to effectively address the underlying barrier, i.e. financial and economic viability of hybrid mini-grids in Mauritania. The size of the OBA scheme is an initial estimate that needs further definition. In part the current proposed amount is informed by the availability of funding. At PPG stage, the cost for the incentive will be clearly quantified.

Through the implementation of the pilot investment project, the appropriateness of proposed policy and financing instruments will be demonstrated. The demonstrations will also be used as a testing ground for developing a domestic technology supply chain. Furthermore, these demos/pilots are expected to generate valuable information on the suitability of, and the practical implementation of the operation & maintenance & management (O&M&M) models that will be developed. The project will seek to test a few alternative models, i.e. in addition to the utility and private sector models, involving community-based organizations (e.g. equipments owned by association of energy users).

2.3 Project Objective, Outcomes, Outputs and Activities

The Project objective is to optimize existing mini grids in Mauritania by providing an adaptive business model and maintaining a sustainable hybrid system (diesel/RE).

Component 1: Policy, regulatory, legislative and financial instruments for hybrid based mini-grids development

Outcome 1.1 & 1.2: Enabling policy and institutional framework for hybrid-based mini-grids set up

This outcome seeks to overcome the policy, regulatory and institutional barriers for creating an enabling environment for the scaling up of hybrid renewable-diesel solutions as inclusive value chain business development by strengthening the institutional framework for hybrid-diesel mini-grid promotion at the national, regional and community level; and operationalize effective policy, legal, and regulatory frameworks and knowledge management. A strong coherent policy and strategy supported by transparent institutional, technical and financial framework will send a clear signal to investors, technology developer, service providers and producers to mobilize their resources to accelerate the market transformation to sustainable hybrid renewable-diesel solutions.

Output 1.1: Policy, institutional and legislative package for hybrid-based electrification adopted

Activity 1.1.1: Support to the government approval and enactment process of the institutional and legislative package

(Ministers, SOMELEC, etc...)

The project, with the assistance of project-hired renewable energy policy experts will support MPEM, APAUS, ARM to define the strategies for the mini-grid and renewable energy policy recommendations to be approved by the Council of Ministers/Government and implemented. Negotiations with Parliamentarians for their support to seek government approval will be critical. The project will accordingly work closely with them and the members of government in promoting and publicising as well as seeking the necessary support for the Project.

The project will also closely work with SOMELEC, the national utility, to help them better understand the aims and goals of the project and how its implementation can help SOMELEC in reaching its electrification targets. SOMELEC being one of the main national actors with a consequent ability to influence discussions and decisions, will be closely associated to all work and proposed decisions/

The GEF project will focus on engaging with stakeholders at the national level. Implication on cross-cutting issues such as the parallel development of renewable energy projects for the national grid and the encouragement of hybrid generation by large industry power producers (mainly off-grid in remote areas) will be taken into account and promoted in order to better integrate the mini-grid policy in the national framework and to ensure maximum synergies between actors.

Activity 1.1.2: Multi-stakeholder consultations and presentation

Mauritania's energy sector actors are quite diversified and can be a source of resistance to change if they are not appropriately consulted, informed and included in the process. In order to ensure maximum buy-in and understanding a series of consultations will be undertaken on a one to one basis as well as within a more participatory workshop. As this project builds on previous projects within the country, namely the joint UNDP/IRENA Renewable Readiness Assessment undertaken in 2013-2014, it will allow to show progress in the actions previously identified by the actors themselves and the effort to follow-up on these identified actions.

The actors included in this action will include representatives from all Line Ministries, National Agencies, NGOs as well as local, private sector and industry representatives involved and affected by the proposed legislative and institutional changes.

Output 1.2: Cornerstone policy instrument and institutional framework defined adopted and enforced

Reduction of upfront investment costs, financially viable tariff, subsidies, harmonized national electricity code, concession regimes licensing rules, PPAs and PPPs for hybrid-based mini-grids.

Activity 1.2.1: RE legislation

Appropriate policy mechanisms will be developed to support the development of RE –based mini-grids and, particularly, wind and solar based mini-grids in Mauritania. The mechanisms that will compose such policy will be developed as consultancies, including a Policy gap analysis, a Rural Electrification Action Plan with special focus on mini-grids, Draft legislation, Adaptation of existing licensing models, Public-private partnership agreements, Operator-community agreements.

The policy package itself will seek to maximise synergies within the country, using recent progress in renewable energy project implementation to show the way forward and help set up the necessary mechanisms and institutional framework. As such, the policy-related part of package will help to shape suggestions made during previous consultations and address the wider renewable energy policy context. This will allow to encourage the development of a broader and deeper renewable energy market within the country, helping to de-risk actions related to the project itself and share the cost of development between all actors.

For example, initiating the discussion of possible hybridisation of off-grid industrial energy production and increased renewable energy production on grid will help to better share the costs of renewable energy development within the country, not limiting it to off grid applications. In a similar manner, some of the barriers to renewable energy development within the country include a perceived risk in terms of capacity to install and maintain renewable systems nationally. The actions envisaged within Component 2, as well as those related to Action 1.2.2 will allow to initiate the necessary framework for broader development while allowing to share future costs between a greater number of actors. This can include the encouragement of:

- hybridization of the mining-industry's generation capacity,
- the injection of excess energy from mining electricity generation in a mini-grid around their company.

The policy-related work of this activity will strongly count on the collaboration and buy-in of the Government institutions related to the success of the enforcement of such policies (MPEM, MAED, but also finance, and also other Government. institutions such as APAUS). Such collaboration will be structured in workshops such as a multi-stakeholder meetings (included in activity 1.1.3) and a specific workshop on rural electrification in the context of the project.

Although this activity will cover both on and off-grid renewable energy targets and actions, its main result will be to help reduce the upfront investment, maintenance and management costs for renewable energy projects, in turn decreasing the tariffs needed to fund renewable-based projects. By including the larger on-grid and industrial/mining off-grid markets, the legislation will help to tap the much greater cost reduction potential of the larger, deeper markets to better serve the ultimate goal: greater, less expensive and cleaner energy access.

Activity 1.2.2 Definition of institutional framework and contractual context for viable mini-grid management

Beyond the general policy framework, Mauritania needs to adapt the current *institutional framework* to better answer current barriers to hybrid mini-grid development and wider renewable energy development. Adjustment to the current institutional framework will help the country to better address these issues while avoiding more risky, broader reforms. This activity will namely help to address the responsibilities for heavy maintenance (currently shared between the DSOs –for daily maintenance- and National Agencies –for heavy maintenance--, project sizing and reception of delivered infrastructures.

Refining the process and responsibilities for project design and reception/acceptance of installed infrastructure will help to smoothen the transition from DSO off-grid to “on-grid” SOMELEC management of infrastructures. Clarifying the institutional framework & ownership structure of the infrastructure will also help to make clear responsibilities and avoid gaps in the lifetime management of projects.

The *contractual context* for project installation, management and maintenance will also be reviewed within this activity. The main actors of rural energy service provision (DSOs, APAUS, MAED, MPEM, ARM) will be consulted and participate in a workshop to help refine the necessary modifications to current contractual documents. The Regulatory Authority will be one of the lead actors within this action, under the authority of the MPEM. The policy consultant, in collaboration with the project team, will assist the ARM in adjusting the current concession regimes as well as the terms, conditions and specifications for DSO management (cahier des charges) to better correspond to hybrid RE/diesel mini-grid needs.

Activity: 1.2.3: Creation of an RE observatory – knowledge management

Despite having a long history of renewable project initiation and installation, Mauritania is still lacking in terms of using lessons learned from previous projects and programmes as well as building a database of renewable energy potential within the country. Creating a “Renewable energy observatory” has been suggested by numerous participants to previous workshops on renewable energy development within the country. This observatory will have to be based within current institutions in order to avoid reproducing errors of the past concerning the multiplicity of actors. It will serve as a “knowledge management” source, intended to collect and make available all existing and future information renewable energy projects, lessons learned and resources. The observatory itself will be based within the MPEM, but its work will need to be undertaken based on a collaborative effort between all the actors, including the MPEM, APAUS, SOMELEC, the University of Science and Technology (Université des Sciences et Techniques de Mauritanie – USTM--), vocational training schools and the National Meteorological Office (ONM). Oversight of the Observatory will be ensured on a collegial basis by all participants, under the auspices of the MPEM.

1.2.3.a Implementation of a Renewable Observatory

Inter-partner consultations will allow to determine the exact placement of the observatory and should also define the format of the oversight committee (including MPEM, but also potentially APAUS, SOMELEC and others). Budgets will be used for observatory personnel expenses, as well as computers & software. Some of the equipment & software will need to also be placed with the observatory partners, such as USTM, in order to allow them to work on the measurements and interpret data they have collected.

1.2.3.b Initiation of a national online wind atlas

Although Mauritania has a history of renewable based projects, much of the information related to the wind data collected during the life of the projects has either been lost, misplaced or is not directly exploitable. This is of extra importance for off-grid applications since the highest potential wind sites –mainly applicable for on-grid large-scale generation– are well known, while the wind potential for more isolated areas, applicable for rural energy service provision, is not sufficiently known. In an effort to use and reinforce existing expertise within the country much of the work to be carried out will be ensured by the USTM researches with the assistance of a wind data expert, the ONM will also be closely associated to this part of the work.

1 Collection of info/resources existing within country

The first task will be to collect all existing data related to wind resources in the country. The MPEM will also have to be closely associated to this part of the task since much of the data is either in the hands of the project initiators, of SOMELEC or other industrial users such as SNIM and will have to be officially requested by the government.

The data will be collected, translated and interpreted in order to extrapolate measurements. These first interpreted measurements will constitute the basis of a future wind Atlas.

2 Additional measure needs defined & measures implemented

Based on the usable data from previous measurement exercises provided by USTM, a proposal for additional data collection will be made. The proposal for additional measurements will be based on:

- centers of population and industry (centers of consumption);
- existing grid networks, planned extensions and grid needs that could potentially be at least partially answered by wind production;
- potential available resources (measurements in the most windy areas which may be of use for grid connected or off-grid wind production);

3 Wind Atlas online

The data collected through both of the previous actions would be made available through an interactive GIS database based on the model provided by ECOWAS. The database and internet portal would need to be built by qualified experts under the common auspices of the Observatory, MPEM and USTM and the oversight of the project coordination committee.

Outcome 1.3: Financial viability of mini-grid ensured

Output 1.3: OBA scheme, LT concessions, and other appropriate tariff for hybrid mini-grid designed and set-up for LT viability

Activity 1.3.1: Appropriate pricing study

An appropriate pricing study will be launched to provide a balanced suggested tariff. This tariff will need to achieve the balance between the local population's ability to pay, the added value brought to the community, and the availability of budgets for RE/off-grid access programs. The tariff study. Permitting cost recovery and cost-based tariffs is essential to enabling the power utility and private sector entities to operate hybrid mini-grid systems. These developers have no ability to cross-subsidize electricity rates and must demonstrate financial viability to obtain financing. The key challenge and task here is to set the mini-grid tariffs at the right level that balance profitability of investment, on one side, with affordability of service for consumers, on the other side. The tariffs should also explore the possibility of a better alignment with SOMELEC tariffs in order to help avoid any competition between energy providers.

Activity 1.3.2: Definition of adapted OBA with ARM

Beyond the pricing study, an adapted Output-Based Mechanism will be defined to encourage the efficient use of infrastructure and encourage resource optimisation. This OBA could be based on existing schemes used to remunerate off-grid DSPs by the ARM. The work under this activity

would be jointly undertaken with the ARM, the MPEM and DSPs. The actual sources of funding to replenish and develop the Universal Access Fund will be identified in activity 1.3.3.

Activity 1.3.3: Vision paper on budgets used & available for RE electrification

A short vision paper will also be prepared to measure current budgets available for rural energy service development. The analysis would include measurements and predictions of current and future budgets available for these developments. This will allow measuring to what extent Mauritania needs to either extend or broaden the collection of funds for off-grid energy service provision.

Component 2: Capacity Building for hybrid mini-grid system management

Outcome 2: Capacity for delivering turnkey solutions and quality O&M

This component will address technical barriers to the implementation of RE-diesel based mini-grids. The expected outputs of this component are to have local capacity (local SMEs with possible international experienced business partners) to install and maintain the SHP-based mini grids deployed and also promote partnerships with local companies that can develop and operate mini-grid concessions or licenses in isolated areas. If Micro grid based electrification is to make a real difference, it requires both financial capital and business know-how that can develop replicability. This component is about building human capital.

Output 2.1 Published guidebook on hybrid diesel/RE based mini-grids development

The project will develop and publish guidelines on design, installation, management and maintenance of hybrid renewable-diesel mini-grids based on the project's lessons learned and similar experiences in other regions. Several sub-sections will be included to cover the management and maintenance of inverse osmosis water desalination units (used for off-grid applications) and refrigeration/ice production units. This guidebook will be accompanied by specific case studies and educational materials aimed to be used in training modules that will be delivered by the university, the SOMELEC school of trades, and other national schools and engineering programmes.

The full operation and maintenance manual should be made available on-line to assist delegated service operators in trouble shooting their installations and maintaining them.

Output 2.2 On-the-job capacity building program for hybrid plant operators delivered, including on materials, plant design, combination construction, O&M

Successful mini grid projects also require human capital from all those involved in the development of a project. In the initial phases of the project, traditional concepts of capacity building, which might focus more on general business skills and technical knowledge, have to be complemented with project specific and problem targeted technical assistance at specific stages of the mini grid development. In the later phases, growing from demonstration single projects to roll out of multiple projects, there will be a need for internally driven human capital development within mini grid developers to complement the earlier technical assistance received. They need detailed knowledge of the local target communities and their socio cultural environment; they need

business and technical knowledge to create a commercially sustainable micro energy company; and, once the equipment is commissioned they must have the technical capacity to operate, maintain, and repair the equipment.

This activity will be focused on Materials and Workshops to be delivered. The Materials will aim at providing concrete, updated and tailored knowledge about the development of RE-diesel based mini-grids in the region. A “Technical solutions and Operational Models Guidebook for RE-diesel based mini-grids” will be published. Capacity building will be about Project Construction, O&M, implemented through two Training Sessions: Training Session 1: design and construction; Training Session 2: O&M.

Capacity building will be provided through training courses and workshops designed by an international consultancy and engineering partner that will deliver such support as part of a technical assistance and backstopping contract. The initial training will be delivered to the selected SME as well as representatives from the faculty of the University, of the SOMELEC school of trades and the other specialised schools of trade. By training the trainers, the project will help to institutionalise specific concrete training within the institutions active in technical training and higher education. This will help ensure the availability of hybrid mini-grid training for all future actors in the sector.

The full training materials will be prepared and made available to the national actors, providing them with a full training module made available for all country sector actors.

Output 2.3 Business and technical advisory services to the power utility and other hybrid mini-grid plant developers

Technical assistance will be provided to competitively selected equipment providers and installers through an open Tender or Call for Expression of Interest for the provision of solar and wind power equipments. An international technology transfer partner (an experienced renewable energy company) will be sub-contracted to deliver such assistance.

On the job, technical engineer advice on maintenance management and optimised plant performance will be made available. Members of faculty trained within the context of activity 2.2 will also be able to participate in the on-the job training efforts.

Output 2.4 Tailored capacity building program delivered to relevant national agencies

Although initial capacity building needs for Delegated Service Operators will have been provided, all skill levels must be taken into account, including government, local institutions and service providers. This will include the MPEM’s Sectorial Focal Point (SFP) in order to assess needs.

A study will be launched to determine remaining needs for “training” that may not be available in the country and identify institutions having the capacity to deliver them. The study of needs will help to define and produce additional specific training modules to be delivered through the training and education institutions in the country.

Component 3: Showcasing a viable hybrid mini-grid business model

Outcome 3: A functioning business model is demonstrated for the technical and financial viability of diesel/RE hybrid-based mini-grids

The expected outcome from this component is the improved confidence of communities, developers, the power utility and potential investors in the technical and economic viability of hybrid-based mini-grid plants.

The showcase will consist of supporting the hybrid diesel/wind power plant project in 4 coastal zones, by putting in place a suitable business model that allows confidence, sustainability and replication. If successful, the project will favor similar initiatives and induce other hybrid plants to secure funding and partners. The showcase will result to the effective installation of 0,5-1 MW of wind power (exact capacity and design will be finalized based on the detailed technical study carried out in activity 3.1.2).

The showcase will be implemented in conjunction with financial instruments and OBA scheme to be designed under Component 1. The showcase (entire Component 3) will demonstrate the financial viability of the proposed business model. Financial viability of hybrid mini-grids will be addressed by introducing a cost-recovery tariff system (Output 1.2) supplemented by output-based aid (OBA) scheme (Output 1.3)

Output 3.1: Pilot sites for mini-grids identified and assessed

The outcome of this component will be to provide a detailed technical study concerning the village needs and the wind resources available. This will allow to propose the most viable economic solution for equipping the villages in energy service needs. Currently, two approaches are feasible, one involving the individual equipment of each village with its own production capacity, mini-grid and related services (water treatment + ice production). The other approach would centralise energy production in one village, and distribute the energy through a medium voltage line while conserving mini-grid and end service needs in each.

Activity 3.1.1: Acquisition of measurement instruments

In order to encourage a more sustainable approach to renewable energy provision for hybrid mini-grids, the project will take the position of providing measurement instruments to local actors. Once the resource has been measured, the instruments will be available for other measurement campaigns to allow replication. The instruments themselves will be jointly managed by the renewable observatory and its partners, including USTM, APAUS as well as the schools of trade. The data itself will be made available through the renewable energy observatory.

Activity 3.1.2: Site assessment + detailed tech study for most appropriate solution

Preliminary studies show that several solutions can be considered for the provision of energy services. The detailed site assessment and technical study will be overseen by an international technical partner in collaboration with local service providers and the USTM. This will allow to ensure national appropriation of the project with the added benefit of building national capacity to undertake part of these studies.

The study will need to:

- carry out a detailed evaluation of needs;
- evaluate renewable energy resources on site to allow to precisely size the capacity need for production;
- produce detailed design and technical specification of the most economical solution;
- prepare the international call for tender for the equipment sourcing and installation.

Output 3.2: Public-Private partnerships are established for the exploitation of hybrid mini-grids

Activity 3.2.: Necessary support program

This activity will ensure the publication of the call for proposals for provision of Delegated Service Operator services, the selection of the local companies and accompanying the process for their implementation. The activity will be carried out in close collaboration with the main actors, including the MPEM, the ARM and APAUS. It will assist the ARM³⁰ in finalising the contractualisation of services and agreements based on the contractual documents prepared under on activity 1.2.2,

The contractual documents will also need to be finalised based on the latest information and progress made within the context of the project. Moreover, the contracts themselves will need to be revised and explained to the selected service provider/DSO.

Output 3.3: 0.6 MW of wind power generation capacity + storage + hybrid system management is installed and managed sustainably in a hybrid power plant covering 4 coastal communities

Activity 3.3 Acquisition, installation and reception

The project will participate in the capital cost of acquisition of the equipment and will ensure that the infrastructure is properly installed and managed. The technical specifications will be jointly validated with the MPEM, APAUS and SOMELEC. In a similar manner, the reception of the infrastructure will be organised to ensure a full verification of conformity with specifications as well as performance. Final reception of the infrastructure will only be confirmed after a full year of operation without major issues.

The work will be divided into lots, potentially allowing national companies to participate in the construction. However, a single entity will need to be responsible for the finalisation, delivery and reception of the infrastructure (as general EPC contractor). The transport and distribution lot should be carried out in close collaboration with SOMELEC in order to ensure that the mini-grid and surrounding infrastructure can be integrated in the national grid when SOMELEC is in a position to connect the project to the national grid.

Output 3.4: Public relation and investment promotion campaign conducted

³⁰ The ARM is responsible for the selection, contractualisation and management of DSOs under the current national institutional framework, under the authority of the MPEM.

Activity 3.4: Awareness raising and investment promotion campaign

This activity will focus on the necessary awareness campaign to be delivered in parallel with the implementation of the project. It will be two-fold aimed on one hand at the local populations, assisting them to better understand the opportunities and constraints related to the provision of electricity services, potable water and cooling/ice, and on the other hand aimed at the institutional actors within the country to help promote the programme and the approach used.

Although some of the local population has already adopted limited electricity provision services through individual solar kits or generators, their use of the available energy and the end-use equipment is not always adapted to the solutions provided. On the other hand, the vast majority of the population has only very limited access to energy services. These will need to be assisted in their use of the installed systems. Finally a number of activities will be made possible by the new infrastructure. However, the populations do not always have the means to invest in the necessary equipment. The awareness raising campaign will help them better understand the potential sources of funding and constraints, such as the partnership with the Small Grants Programme that is already envisaged to accompany the adoption of new techniques and added value activities.

Output 3.5: The business model concept replicated.

The project will have helped showcase the viability of the hybrid RE-diesel mini-grid solutions and the accompanying business model. However, in order to ensure replication, the project will disseminate the results of the project among Parliament and Government and energy sector actors to advocate for long term political and budget commitment. Based on the success of the project, replication of the mini grid model can be extended as well to villages that have other potential RE sources to generate electricity.

As well, the project will seek to disseminate information among the potential target communities through communication channels such as radio, printed documentation, events and also seek to establish information channels in the different regions of the country.

2.4 Project indicators, risks and assumptions

2.4.2 Project indicators

Activities	Proposed Indicators
Component 1: Policy, regulatory, legislative and financial instruments for hybrid based mini-grids development	
Output 1.1: Policy, institutional and legislative package for hybrid-based electrification adopted	
<i>Activity 1.1.1: Support to the government approval and enactment process of the institutional and legislative package</i>	- Approval of the legislative package

<i>Activity 1.1.2: Multi-stakeholder consultations and presentation</i>	<ul style="list-style-type: none"> - Workshop report and participant list - Stakeholder inputs and discussions (workshop + mission report)
Output 1.2: Cornerstone policy instrument and institutional framework defined adopted and enforced	
<i>Activity 1.2.1: RE legislation</i>	- Legislative package finalised and presented
<i>Activity 1.2.2 Definition of institutional framework and contractual context for viable mini-grid management</i>	<ul style="list-style-type: none"> - Revised institutional framework proposed - Implementation of the institutional framework - Revised contractual relationship with DSPs published (“cahier des charges”)
<i>Activity: 1.2.3: Creation of an RE observatory (MPEM?) – knowledge management</i>	<ul style="list-style-type: none"> - Implementation and existence of the observatory within the MPEM - Collegial multi-stakeholder management committee held
<i>1.2.3.a Implementation of a Renewable Observatory</i>	- Official Ministry nomination of Observatory and mission published
<i>1.2.3.b Initiation of a national online wind atlas</i>	<ul style="list-style-type: none"> - On-line national wind atlas available - Additional measurement campaigns carried out - Historical data recovered, interpreted and available
Output 1.3: OBA scheme, LT concessions, and other appropriate tariff for hybrid mini-grid designed and set-up for LT viability	
<i>Activity 1.3.1: Appropriate pricing study</i>	- Publication of pricing study
<i>Activity 1.3.2: Definition of adapted OBA with ARM</i>	- Revised framework for hybrid-based DSP management remuneration published and implemented
<i>Activity 1.3.3: Vision paper on budgets used & available for RE electrification</i>	- Vision/strategy paper published
Activities	Proposed Indicators
Component 2: Capacity Building for hybrid mini-grid system management	
<i>Output 2.1 Published guidebook on hybrid diesel/RE based mini-grids development</i>	- Published guidebook on hybrid mini-grid development and maintenance
<i>Output 2.2 On-the job capacity building program for hybrid plant operators delivered, including on materials, plant</i>	- 2 technicians and one manager trained to operate the project’s hybrid mini-grid;

<i>design, combination construction, O&M</i>	<ul style="list-style-type: none"> - Teachers from vocational schools (SOMELEC, ISET,CSET) and university trained within the project training module; - Training module available and integrated within existing curriculum of vocational schools and university.
<i>Output 2.3 Business and technical advisory services to the power utility and other hybrid mini-grid plant developers</i>	<ul style="list-style-type: none"> - Advisory services used for equipment reception, installation and management; - Participation of partner schools and universities to on-site training.
<i>Output 2.4 Tailored capacity building program delivered to relevant national agencies</i>	<ul style="list-style-type: none"> - Study measuring remaining needs published; - Additional training modules prepared and delivered;
Activities	Proposed Indicators
Component 3: Showcasing a viable hybrid diesel and wind power based mini-grids business model	
<i>Output 3.1: Pilot sites for mini-grids identified and assessed</i>	
<i>Activity 3.1.1: Acquisition of measurement instruments</i>	<ul style="list-style-type: none"> - Measurement instruments acquired and installed; - Collegial “RE observatory” decision on next priority sites for measurement; - Responsibility for instrument management and contract signed (ONM).
<i>Activity 3.1.2: Site assessment + detailed tech study for most appropriate solution</i>	<ul style="list-style-type: none"> - Specific wind measurements for project site available and exploitable; - Detailed technical study published; - “Cahier des charges” for equipment offers published.
<i>Output 3.2: Public-Private partnerships are established for the exploitation of hybrid mini-grids</i>	
<i>Activity 3.2.: Necessary support program</i>	<ul style="list-style-type: none"> - Call for Proposals for DSP management of project written and published; - Revised contractual relationship with DSPs published; - DSP(s) selected.
<i>Output 3.3: 0,6 MW of wind power generation capacity + storage + hybrid system management is installed and managed sustainably in a hybrid power plant covering 4 coastal communities</i>	

<i>Activity 3.3 Acquisition, installation and reception</i>	- Infrastructure installed and operational
Output 3.4: Public relation and investment promotion campaign conducted	
<i>Activity 3.4: Awareness raising and investment promotion campaign</i>	- Local populations are informed on the aims and goals of the project, aware of accompanying financing instruments; - Promotional material is published and delivered.
Output 3.5: The business model concept replicated	
	- “lessons learned” document is published and disseminated; - promotional campaign is delivered to national policy and market actors.

2.4.2 Project risks and assumptions

Table 7: Project risks and mitigation actions

Risk	Level of Risk	Mitigation Action
Political risk: Project implementation is a risk, as the country faced project cancellations in the past due to political instability. In addition, Mauritania is located in the very unstable part of the unsecured Sahara.	Moderate	The current political situation in the country is stable. However, this risk exists due to recent legislative election contests. To mitigate this risk, the project will build a wide coalition of partners and stakeholders whose interest in hybrid mini-grids promotion will likely to sustain, even in case of regime change. They include local businesses and communities, NGOs and international development agencies.
Policy risk The success of this project will be determined to a large degree by adoption and effective enforcement of the proposed policies. Lack of political support may jeopardize the achievement of immediate results and over-all impact.	Low	Initial consultations with the Government of Mauritania have indicated an interest and a willingness to establish a Renewable Energy Support Unit and an Investment Grant Mechanism for Renewable Energy projects. The political will to support this project is strong.
Technology risk The crack of Solar panels or wind turbines is quite common and could result to systems breaking down. Insufficient quality of	Moderate	The project intends to utilize proven feasible and affordable technologies and replicate solutions that have been successfully introduced in several countries in the region. In this respect, the

Risk	Level of Risk	Mitigation Action
locally produced equipment leading to early breakdown of the systems and dwindling consumer confidence in the technology.		project will build partnership with material producers established in the country.
<p>Financial risk</p> <p>Widespread poverty and lack of sustainable source of income resulting in low ability to pay for energy supply services. There is also a lack of ability to finance projects for SMEs.</p>	Moderate	The project voluntarily decided to work with already existing mini-grids. In these areas, there is already a capacity and willingness to pay from end-users. On the other hand, the combination of the power utility business model and private sector business model through PPP (public private partnerships) will reduce the financial risk from both side (utility side and private sector side).
<p>Market risk</p> <p>In Mauritania, hybrid systems will have to compete with subsidized and locally available diesel alternatives, such as Multifunctional platforms (MFP) running on diesel. Without additional incentives, hybrid plants will likely to remain uncompetitive.</p>	High	Introduction of financial viable tariff for hybrid diesel/RE-based mini-grids will be a cornerstone instrument of the proposed policy package and business model, aimed specifically at addressing this market risk by levelling the playing field for RE against other available alternatives. Financial commitments will be secured to sustain the policy package and business model operation beyond the GEF proposed project duration from the Government and other donors.
<p>Climate risk</p> <p>Climate change is predicted to cause changes and increase variability of Mauritanian solar and wind patterns. Higher temperatures may cause solar panels to overheat and reduce their productivity. Stronger winds may cause panels to break, while increasing the amount of dust settling on the surface.</p>	Moderate	In the case of extreme climate change, regular maintenance and inspection will help to ensure the performance of solar and wind solutions, overheat or destruction. The choice of resistant and well-adapted materials will also be of importance. Both of these actions are important to protect from climate risks.
Overall Risk Rating	Moderate	

2.5 Financial modality and cost-effectiveness

Current baseline solutions for mini-grid remote-access energy services in Mauritania are exclusively based on diesel generation. Electricity produced on mini-grids is estimated at an average of 0.54 USD/kWh for diesel based electricity generation. While an average world-level price for hybrid diesel-renewable (PV or Wind) mini-grids is estimated to be 0.4 USD/kWh without

subsidies³¹. In the case of the project, potentially competitive renewable sources such as biomass or hydro-power are not available in the area due to the arid nature of the region, while hydro-power resources are limited to the extreme south of the country.

The combined direct and indirect global benefits of the project have been assessed at least 47,000 tons of CO₂eq. With a GEF funding request of US\$ 1,270,142 US\$, this corresponds to an abatement cost of less than 27 US\$ per ton of CO₂ reduced.

2.6 Sustainability

From technical and economic points of view, the sustainability of hybrid-based power generation has been proven in the international market, both in the context of developed and developing countries. By addressing the underlying policy and financing barriers that impede the development of hybrid systems in Mauritania, the creation of a sustainable niche for Solar PV and wind power systems will be realized. Financial sustainability of hybrid system will be ensured via the introduction of financially viable business models, which in its pilot stage will be supported with output-based aid scheme and long-term concession. In addition, the project will address the capacity needs of all actors across the entire rural electrification system value chain. This capacity building will have long term impact on both sustainability and scaling up.

2.7 Replicability

The project will enable large-scale replication by removing underlying policy, technical and financial barriers to investment in diesel/RE hybrid-based mini-grids. There are at least 5 hybrid mini grid projects that can serve as replication. This number is expected to increase gradually in the future. This constitutes a big potential for replication and scaling up of the proposed GEF funded project, as an operational business model will be defined and adopted for hybrid mini-grid systems.

In addition, the availability of specific training for managing and maintaining these systems will allow to ensure a constant pool of well-trained professionals, while the creation of a renewable observatory will help to promote these actions and encourage their replication.

2.8 Innovation

Several distinctive features contribute to the project's innovativeness:

- *Promotion of hybrid electricity generation systems:* The combination of diesel and renewable energy into one power plant will improve the sustainability of the mini-grid. In addition, the system will address several local population needs, starting with electricity, but also through the production of potable water and ice, helping to increase the global value of the system itself.
- *Promotion of a combined utility and private sector business model:* through a hybrid business model (PPP) combining the advantages of both models.
- *Promotion of a widespread knowledge management and sharing system:* as for most development projects, this one will include capacity building and training actions.

31 *Hybrid Mini-grids for Rural Electrification: Lessons Learned*, Alliance for Rural Electrification (ARE); 2011. And *Hybrid Power Systems*; IRENA; 2013

However, in an effort to enlarge the scope, teachers/trainers from the University and from the SOMELEC school of trades will participate in the training, in addition the training modules will be made available for national training programs, while the data collected within the context of the project will be made available to all national actors and conserved by both the MPEM and the National Office of Meteorology.

In addition, Mauritania does not have any renewable energy policy, and this project will fill this gap.

2.9 Global Environmental Benefits

The project will result in direct and indirect GHG emissions reduction and avoidance from supporting demonstration projects (direct) while facilitating design and implementation of national policies for hybrid renewable-diesel based electricity generation and capacity building (including design, maintenance and management) for present and future projects (indirect). The project is expected to not only reduce GHG emission, but also avoid future emissions growth by paving the way with the use of energy solutions with renewable technologies. This provides and contributes to the global goal of mitigating climate change.

2.9.1 GHG Emission Mitigation from the Use of Hybrid RE mini-grids

The project will enable rural areas to benefit from access to modern energy services, impacting more than 2 700 people on a permanent basis, taking into consideration that the population of these villages more than doubles during the fishing season.

Table 8: Target village population

Village	M'heijratt	Tiwilit	Lemcid	Bellawakh
Households	150	80	40	100
Permanent Pop (est)	1,380	480	240	600

With regard to direct GHG emissions, socio-economic analysis conducted during the mission in the target villages reveal the following baseline energy use patterns:

- Lighting is either insured through candles or battery powered electric lights;
- For other electricity needs, disposable and rechargeable batteries are in common use, which are either charged on-site from diesel generators or require long travel (over 20-30 km) to nearby centers for recharge;
- Thermal generators exist in some of the locations to supply community centers (health centers, etc...).

Under a business as usual case, GHG emissions would likely increase since the villages would eventually be equipped with diesel generation linked to a mini-grid to provide household needs, water desalination services and ice production.

In this context, project-supported RE-diesel mini grids will replace fossil fuel consumption which in a baseline scenario would be supplied to the villages and will result in 1,845 tCO₂ eq/year the first year or about 47,000 tons CO₂ equivalent over the technology's 20 year lifetime. This is

considering a 30% capacity factor for the wind turbines and a 2.5% increase in consumption per year. A detailed technical study to estimate load factors and capacity factors is planned at the initiation of the project to carefully assess needs, wind potential and technical sizing. The current estimated technical solution for the four villages is included in the following table.

Table 9: Estimated technical Solution for 4 villages³²

	Capacity
Wind turbines (19 x 30 kW turbines)	570 kW
Diesel Generator (2 x 220 kW)	440 kW
Batteries	972 kWh
Fresh water capacity/day/village	4 000 litres
Ice production capacity/day/village	1-2 t

Direct post-project: The project does not include activities (e.g., a Fund) that would result in direct post-project greenhouse gas emission reductions.

Indirect: Using the GEF bottom-up methodology, indirect emission reductions attributable to the project are 141,000 tonnes of CO₂ equivalent. This figure assumes a replication factor of 3.

According to the Manual, Approach 2a-Top-down information but with a bottom-up methodology, that is: $CO_{2\text{indirect TD}} = CO_{2\text{ TM}} * CF$

Thus, the $CO_{2\text{Indirect Top Down}}$ reductions are:

$5 \text{ MW} * 8760 \text{ h} * 50\% * 0,786 \text{ tCO}_2/\text{MWh} = 34,426 \text{ tCO}_2 \text{ eq/y}$; and during the 20 years of lifetime of the investment, 688,520 tCO₂ eq.

As a summary, the estimated Direct and Indirect reduction of CO₂ eq emissions is:

Table. GHG emission reductions

Time-frame	Direct project	Indirect post-project (bottom-up)	Indirect post-project (top-down)
Total CO ₂ emissions reduced (tons)	47,000	141,000	688,520
Unit abatement cost of GEF funds	\$27.0	\$9.0	\$1.8

³² to be confirmed by detailed technical study undertaken within the project

2.10 Cross Cutting Issues

2.10.1 Gender Equity Issues

Women bear the brunt of household chores in fishing villages. Women are responsible for water collection and all household chores, representing a large amount of their productive time. To a certain extent, they are also mainly responsible for managing household expenses and education.

Not only will local access to electricity and potable water help to reduce costs born by the households, but also free up time for women. Local access to electricity and drinking water will help to reduce the time spent on chores. Women are one of the main sources of added value in fishing villages. In most cases, they are the ones that transform the fishing product, cleaning it, drying it, transforming it into fish flour or flake and producing fish oil from the remains. In all, a total of 11 women's cooperatives, representing more than 420 women, were identified in the four villages covered by the project.

The production of ice, mainly used for fish conservation, will also help to increase revenue from fishing in the villages. All in all, between the increased revenue afforded to the households and decreased costs from the provision of local electricity, water and ice, local populations will have access to higher revenues. In turn this should allow local populations to conserve more added value from their own production and re-invest in new activities.

Some of the accompanying programmes, such as the GEF-SGP's (although not accounted for as co-funding), will assist the local women's cooperatives in transforming their produce and extracting more added value. In addition, the SGP will consider assisting local populations (once again mostly women's cooperatives) in collecting the remaining fish residues, transforming them into fertilizer and initiating a local, small agriculture project.

All of these measures should not only improve the daily life of women, but also assist them in initiating productive activities to produce more local added value. This will help empower women that are currently limited in their options to help encourage development.

2.10.2 Poverty and MDG

The project will help to alleviate a number of issues related to Millennium Development Goals.

Villages that are currently very poor and pay the maximum for the little energy services they can afford will be provided more affordable, accessible energy services and potable water. Villagers will be able to sell their produce at better prices in the city thanks to refrigeration provided by the production of ice. Time saved on household chores will provide opportunities for women to increase transformation and added value to local produce, in turn providing more revenue. Accompanying programs such as the one provided by the SGP will be able to fund additional activities including local, small-scale agriculture, helping to increase subsistence farming as well as limited revenue-producing produce.

The electrification of the villages will assist primary education targets as well. It will allow to increase the time spent studying after dark while providing an extra motivation for teachers to

move in to existing education infrastructures due to the availability of basic public services such as drinking water and electricity.

The reduction in time spent collecting water and on household chores will free women to increase their productive activities. Women's cooperatives already transform the fishing produce, added corollary programmes will allow them to increase their revenues even more.

The availability of fresh, locally produced drinking water will help to decrease diseases.

More importantly, the project will help to promote sustainable energy sources and a new energy service business model including water and ice production. This combined model helps to introduce additional activities for the Delegated Service Operators, justifying higher levels of presence, maintenance and management since the costs linked to infrastructure management will be spread over a larger selection of activities.

2.10.3 Socio-Economic Benefits

The project is expected to provide significant socio-economic benefits to the communities covered by the project. The four coastal villages are traditional fishing villages, whose permanent population is mainly composed of Imraguens – a native and indigenous ethnic group. Seasonal activities can double during the villages' population during the various fishing seasons.

Due to the remote nature of the villages, fishermen are in most cases obliged to sell their produce directly to wholesalers. As they do not currently have access to cooling or ice for the conservation of their take, they are obliged to either sell the fish to wholesalers or dry the fish locally. As can be seen in the following table, prices are much higher on the main Nouakchott fish market than those proposed by wholesalers.

Table 11: Wholesale and Nouakchott Market prices for fish³³

Fish	Wholesaler price (on site)/kg (USD)	Nouakchott market price/kg (USD)
Coubine	1.72	6.86
Mullet	0.52	2.57
Octopus	3.43	5.49

Based on interviews carried out during the inception mission, an approximate total of 1.4 t of mullet is fished per year (500 fishing boats for the four villages, for a catch of between 500-1 000 kg/month/boat over the 4 months of the mullet fishing season). The wholesale price for the yearly total amounts to 751 000 USD, while the Nouakchott market price would amount to 3.7 million USD, a difference of 3 million USD between the base case and the project case. This provides an approximation of the potential local benefits, tripling the cash flow to the villages.

In addition, the costs borne by households for their energy services will be reduced at the same time as those born by fisherman for transporting their produce, while potable water will not only become available on-site, but will also probably cost less than half of the current prices paid by

³³ Based on local interviews on site

the local population (the price for water will need to be determined by the pricing study. Finally, new added-value activities will provide real socio-economic benefits to local populations while empowering women through their participation in women's cooperatives new activities.

I. PROJECT RESULTS FRAMEWORK:

This project will contribute to achieving the following Country Programme Outcome as defined in CPAP or CPD: From CPAP component 3: Improving environmental governance and rational use of natural resources					
Country Programme Outcome Indicators: Level of Greenhouse gas emissions					
Primary applicable Key Environment and Sustainable Development Key Result Area (same as that on the cover page, circle one):					
4. Expanding access to environmental and energy services for the poor.					
	Indicator	Baseline	Targets End of Project	Source of verification	Risks and Assumptions
Project Objective To optimize existing mini grids in Mauritania by increasing the share of Renewable Energy (RE) and developing an appropriate business model for the sustainability of the hybrid system	Investment in hybrid RE-diesel mini-grid projects mobilized in comparison to baseline year 2014 Amount of reduced CO ₂ emissions by the investments facilitated by the project (in rural electricity generation compared with the baseline) Number of MWh produced under the project Number of people in rural areas benefiting from access to better services	0 USD/year (2014) 2014: the baseline assumes that all new demand for electricity will be met by diesel generators	By the end of the project –year 4 (EOP): a total of 7 million USD of investment from the government, multilateral aid organisations and private sector will be mobilized. EOP: 47 104 tCO ₂ 64.2 MWh (2.5 MWh/y over 20 year lifetime with a 2.5% growth/year) EOP: 4 sites, 430 households benefiting from access to better energy services, water and cooling for fishing produce	Monitoring and reporting on total RE-diesel mini-grid investments triggered by the project. M & E framework Monitoring and reporting of yearly generation of installed pilot RE-diesel mini-grid pilot project	Investors' risk is lower than estimated Co-financing from government and multilateral institutions does not materialize The installed capacities are lower than anticipated; Downtime of RE-diesel mini-grid projects, identification and construction is lengthier than expected.
Outcome 1.a Enabling policy and institutional framework for hybrid-based mini-grids set up	Legislative package is designed and enacted Revised institutional framework	0 0	Revised legislative package encouraging the development of renewable energy Revised institutional framework put in place	MPEM publication of the relevant legislation Development and submission to the government of the legislation	Country priorities for policy and regulation on rural electrification are shifted to other issues New regulation is not adopted by government

	Creation of a renewable observatory	0	A RE observatory is in place and functioning	Implementation of the revised institutional framework Online national wind atlas available	
Outcome 1.b Financial viability of mini-grid ensured	Revised framework for hybrid-based DSP is implemented The level of investment and tariff reforms ensure the financial viability of mini-grids	Existing framework for remuneration not taking hybrid grid management into account 0	New framework implemented New sources of financing for tariff subsidisation researched	MRA publication of tariffs Signature of new partnerships, proposal of new legislation for collection of funding	New, sustainable pricing is deemed politically unviable Political support for DSP extension not sufficient Legislative and institutional framework deemed too risky by IFIs
Outcome 2 Outcome 2: Capacity for delivering turnkey solutions and quality O&M&M	Ministry and related agency representatives have the capacity to understand and design measures to ensure quality O&M&M. Education and professional training necessary for quality O&M&M are implemented and viable.	Technicians trained on a project to project basis Limited RE training in vocational schools and limited practical training in university modules Non-existent	Training module available and implemented Advisory services used for training, project preparation and management Participation of schools and universities in project training	Publication available M&E report	Training and education institutions do not cooperate/prefer keeping their prerogatives Training and education institutions do not deem RE training to be important enough to modify curriculum
Outcome 3 A functioning business model is demonstrated for the technical and financial viability of diesel/RE hybrid-based mini-grids	Coastal community project is demonstrated to be financially and technically viable. Lessons learned from the project are applied to future off-grid projects.	Non-existent Non-existent	Local populations have adopted project and devised additional activities to use existing infrastructure Measurement instruments are operational and managed in a collegial manner	M&E report Equipment management contract/agreement signed	Infrastructure inappropriate for projected uses, improper installation Political support insufficient Measurement instruments are damaged

			Additional measurements undertaken for potential additional hybrid-RE sites	M&E report	
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II. Total budget and workplan

Award ID:				Project ID(s):								
Award Title:		GEF PIMS 5357 Hybrid Minigrids Mauritania										
Business Unit:		MRT10										
Project Title:		Promoting Sustainable Mini-grids in Mauritanian provinces through hybrid technologies										
PIMS no.:		5357										
Implementing Partner (Executing Agency):		APAUS										
Components	Responsible party	Source of Funds	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount (USD)	Amount (USD)	Amount (USD)	Amount (USD)	Amount (USD)	Notes	
						Year 1	Year 2	Year 3	Year 4	Total		
1. Policy, regulatory, legislative and financial instruments for hybrid based mini-grids development	APAUS	62000	GEF	71200	International Consultants	20,000	10,000	10,000	10,000	50,000	1	
		62000	GEF	71300	Local consultants	20,000	20,000	20,000	20,000	80,000	2	
		62000	GEF	71600	Travel	10,000	10,000	2,500	2,500	25,000	3	
		62000	GEF	72200	Equipment & Furniture	10,000	10,000	10,000	10,000	40,000	4	
		62000	GEF	72100	Contractual Services-Companies	25,000	25,000	20,000	20,000	90,000	5	
		62000	GEF	74200	Audio Visual & Print Prod Costs	5,000	5,000	5,000	5,000	20,000	6	
		62000	GEF	75700	Training, workshop and Conferences	5,000	5,000	5,000	5,000	20,000	7	
		62000	GEF	74500	Miscellaneous	2,500	2,500	2,500	2,500	10,000	8	
		Total GEF Outcome 1					97,500	87,500	75,000	75,000	335,000	
		4000	UNDP	72100	Contractual Services - Companies	15,000	15,000	15,000	15,000	60,000	9	
		4000	UNDP	71400	Contractual Services - Individuals	10,000	10,000	10,000	10,000	40,000	10	
		Total UNDP Outcome 1					25,000	25,000	25,000	25,000	100,000	
Total Outcome 1					122,500	112,500	100,000	100,000	435,000			
2. Capacity Building for hybrid mini-grid system management	APAUS	62000	GEF	71200	International Consultants	10,000	10,000	10,000	10,000	40,000	11	
		62000	GEF	71300	Local consultants	10,000	10,000	10,000	10,000	40,000	12	
		62000	GEF	71600	Travel	5,000	10,000	10,000	10,000	35,000	13	
		62000	GEF	75700	Training, workshop and Conferences	10,000	10,000	10,000	10,000	40,000	14	
		62000	GEF	72200	Equipment & Furniture	5,000	5,000	5,000	5,000	20,000	15	
		62000	GEF	74500	Miscellaneous	2,500	2,500	2,500	2,642	10,142	8	
		Total GEF Outcome 2					42,500	47,500	47,500	47,642	185,142	
		Total Outcome 2					42,500	47,500	47,500	47,642	185,142	

3. Showcasing a viable hybrid mini-grid business model	APAUS	62000	GEF	71200	International Consultants	5,000	15,000	15,000	15,000	50,000	16	
		62000	GEF	71300	Local consultants	10,000	20,000	20,000	20,000	70,000	17	
		62000	GEF	71600	Travel	5,000	10,000	15,000	15,000	45,000	18	
		62000	GEF	72100	Contractual Services-Companies	25,000	100,000	100,000	100,000	325,000	19	
		62000	GEF	71400	Contractual Services - Individuals	10,000	15,000	15,000	15,000	55,000	20	
		62000	GEF	72400	Communic & Audio Visual Equip	10,000	20,000	20,000	30,000	80,000	21	
		62000	GEF	75700	Training, workshop and Conferences	2,500	2,500	5,000	5,000	15,000	22	
		62000	GEF	74500	Miscellaneous	2,500	2,500	2,500	2,500	10,000		
		Total GEF Outcome 3					70,000	185,000	192,500	202,500	650,000	
		4000	UNDP	72100	Contractual Services - Companies	5,000	15,000	15,000	15,000	50,000	23	
		4000	UNDP	71400	Contractual Services - Individuals	5,000	15,000	15,000	15,000	50,000	24	
		Total UNDP Outcome 3					10,000	30,000	30,000	30,000	100,000	
		Total Outcome 3					80,000	215,000	222,500	232,500	750,000	
Project Management	APAUS	62000	GEF	71300	Local consultants	7,500	7,500	7,500	7,500	30,000	25	
		62000	GEF	71600	Travel	5,000	5,000	5,000	5,000	20,000	26	
		62000	GEF	72200	Equipment & Furniture	5,000	5,000	5,000	5,000	20,000	27	
		62000	GEF	74599	Direct Project Cost	5,000	5,000	5,000	5,000	20,000	28	
		62000	GEF	74500	Miscellaneous	2,500	2,500	2,500	2,500	10,000	8	
		Total GEF Project Management					25,000	25,000	25,000	25,000	100,000	
		4000	UNDP	72100	Contractual Services - Companies	15,000	15,000	15,000	15,000	60,000	29	
		4000	UNDP	71400	Contractual Services - Individuals	20,000	20,000	20,000	20,000	80,000	30	
		4000	UNDP	74599	Direct Project Cost	15,000	15,000	15,000	15,000	60,000	31	
		Total UNDP Project Management					50,000	50,000	50,000	50,000	200,000	
Total Project Management					75,000	75,000	75,000	75,000	300,000			
Total GEF					235,000	345,000	340,000	350,142	1,270,142			
Total UNDP					85,000	105,000	105,000	105,000	400,000			
TOTAL Project					320,000	450,000	445,000	455,142	1,670,142			

BUDGET NOTES

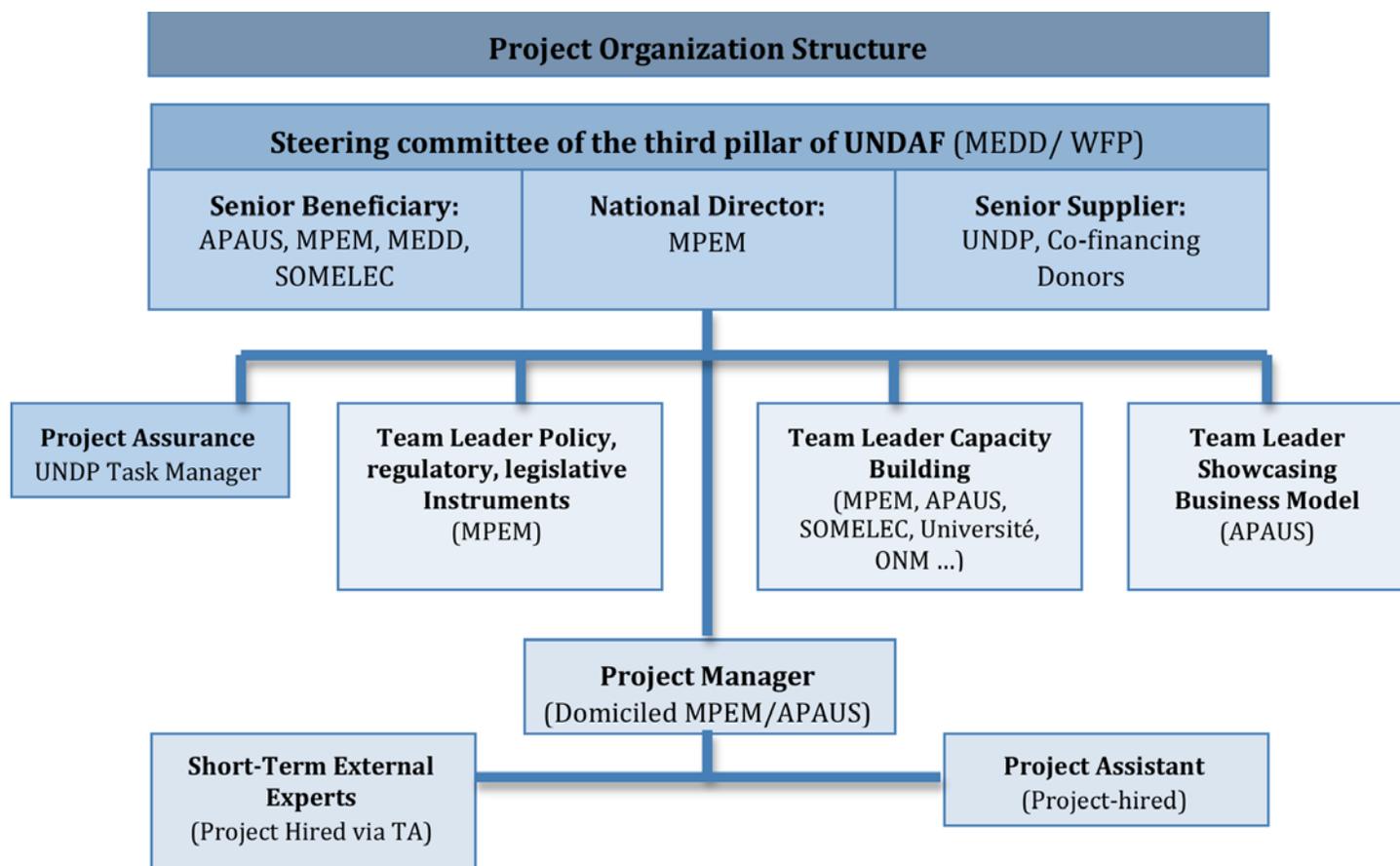
- 1 International expert (RE-based mini-grids) will, with assistance of local consultants, design the de-risking instruments
- 2 Local consultant will be hired to support the design of de-risking instruments
- 3 International/domestic travel to project sites
- 4 Equipment costs cover promotion documents and equipments
- 5 Companies hired to support policy design, enact and enforcement

- 6 Printing and reproduction of legal and technical documentation
- 7 Training, workshop, meetings related to policy design, enact and enforcement
- 8 Miscellaneous
- 9 Companies hired to support policy design, enact and enforcement
- 10 Individuals hired to support policy design, enact and enforcement
- 11 International expert (RE-based mini-grids) hired to support capacity building programs
- 12 Local consultant will be hired to support capacity building programs
- 13 International/domestic travel to project sites
- 14 Training, workshop, meetings related to capacity building programs
- 15 Equipment costs cover promotion documents and equipments
- 16 International consultant will provide technical advice
- 17 Local consultant will be hired to support international consultant
- 18 International/domestic travel to project sites
- 19 Companies hired to support hybrid minigrids roll-out
- 20 Individuals hired to support hybrid minigrids roll-out
- 21 Equipment costs cover promotion documents and equipments
- 22 Training, workshop, meetings related to hybrid mini-grids
- 23 Companies hired to support hybrid minigrids roll-out
- 24 Individuals hired to support hybrid minigrids roll-out
- 25 Project Personnel/management related cost.
- 26 International/domestic travel to project sites
- 27 Equipment and furniture for Project Management Unit
- 28 Others projects costs
- 29 Project Personnel/management related cost.
- 30 Project Personnel/management related cost.
- 31 Others projects costs

SUMMARY OF FUNDS

Sources of Cofinancing	Name of Cofinancier	Type of Cofinancing	Amount (\$)
National Government	Ministry of Energy	In-kind	2,000,000
National Government	SOMELEC (Power Utility)	In-kind	150,000
National Government	National Office of Meteorology	In-kind	100,000
GEF Agency	UNDP	Grant	400,000
Bilateral agencies	IRENA/ADFD (through Ministry of Energy)	Loan	5,000,000
Total Co-financing			7,650,000

III. Management Arrangements



The Project Organization will be comprised of a Project Board, a Project Management Unit, led by the Project Manager, and specific teams for carrying out the activities for the project and an International Consultancy and Backstopping unit as Project Support.

Description of each position:

MPEM and APAUS will be the government institutions responsible for the implementation of the project and will act as the Implementing Entity/Responsible Partner. UNDP is the Executing Entity/Implementing Partner for the project and accountable to the GEF for the use of funds. The project is a National implementation modality (NIM) project.

The overall responsibility for the project implementation by MPEM and APAUS implies the timely and verifiable attainment of project objectives and outcomes. MPEM and APAUS will provide support to, and inputs for, the implementation of all project activities.

Working closely with MPEM and APAUS, the UNDP Country Office (UNDP-CO) will be responsible for: (i) providing project assurance services to government (ii) recruitment of project staff and contracting of consultants and service providers; (iii) overseeing financial expenditures against project budgets approved by the Project Board; and (iv)

ensuring that all activities including procurement and financial services are carried out in strict compliance with UNDP/GEF procedures. A UNDP staff member will be assigned with the responsibility for the day-to-day management and control over project finance.

The UNDP country office shall provide support services for the Project as: (i) HR activities including recruitment of project personnel, issuance of project personnel contracts etc; (ii) process of undertaking procurement activities of project goods and services; (iii) finance transactions; etc and charge the DPC according to Actual Price List for Direct Support Cost”.

A Project Board will be established at the inception of the project to monitor project progress, to guide project implementation and to support the project in achieving its listed outputs and outcomes. It will be co-chaired by UNDP and MEDD. The MPEM as the key ministry in charge of energy and APAUS, as the key governmental agency in charge of rural electrification, will ensure that other governmental agencies are duly consulted and involved as per their mandate such as the Ministry of Environment and Sustainable Development, MAED and others. The Board will remain sufficiently lean to facilitate its effective operation. Other participants can be invited into the Board meetings at the decision of the Board.

The final list of the Project Board members will be completed at the outset of project operations and presented in the Inception Report by taking into account the envisaged role of different parties in the Board. The project manager will participate as a non-voting member in the Board meetings and will also be responsible for compiling a summary report of the discussions and conclusions of each meeting.

The day-to-day management of the project will be carried out by a Project Management Unit (PMU) under the overall guidance of the Project Board. The PMU will be established in the APAUS offices, consisting of a full time Project Manager and three Team Leaders responsible for their specific areas, as elaborated in the organizational chart above (Teams A-Policy and institutional framework-, B-Capacity building, C-Implementation/showcasing). For successfully doing this, public outreach, establishment of the contacts and co-operation with the key local and international stakeholders and expert institutions as well as ability for adaptive management and new innovative approaches will be of utmost importance and will be emphasized in the recruitment. This core team will be complemented during the project implementation by the required short time legal, technical and financial experts to support the identified specific areas of work. Contacts with experts and institutions in other countries that have already gained experience in developing and implementing similar projects are also to be established. The Project Manager will report to UNDP and the Project Board. The Terms of Reference of the key project personnel are presented in Annexes Part IV of this Project Document. The project personnel will be selected on a competitive basis in accordance with the relevant UNDP rules and procedures and in consultation with the UNDP-GEF Regional Technical Adviser.

At the outset of project operations, a project inception report will be prepared in co-operation with the key stakeholders, local and international expert(s) engaged in leading or supporting the implementation of the project. The inception report will include detailed work plans for each subcomponent (output) of the project at the specific activity level and elaboration of the required resources and stakeholders to be involved for reaching the stated targets. These output specific work plans will provide the main basis for day-to-day management, implementation and monitoring of the progress of the project, complemented by the annual monitoring to be done at the Outcome level by the PIRs. For further details about the project's overall monitoring and evaluation framework, see chapter 6.

UNDP Mauritania will maintain the oversight and management of the overall project budget. It will be responsible for monitoring project implementation, timely reporting of the progress to the UNDP Regional Co-ordination Center and the GEF as well as organizing mandatory and possible complementary reviews and evaluations on an as-needed basis. It will also be responsible for procurement of the required expert services and other project inputs and administer the required contracts. Furthermore, it will support the co-ordination and networking with other related initiatives and institutions in the country.

For successfully reaching the objective and outcomes of the project, it is essential that the progress of different project components will be closely monitored both by the key local stakeholders and authorities as well as by project's international experts, starting with the finalization of the detailed, component-specific work plans and implementation arrangements and continuing through the project's implementation phase. The purpose of this is to facilitate early

identification of possible risks to successful completion of the project together with adaptive management and early corrective action, when needed.

In order to accord proper acknowledgement to GEF for providing funding, a GEF logo should appear on all relevant GEF project publications, including any hardware purchased with GEF funds. Any citation on publications regarding projects funded by GEF should also accord proper acknowledgement to GEF in accordance with the respective GEF guidelines.

During implementation, proper care will be taken to have adequate communication and co-ordination mechanisms in place to ensure that areas of common interest can be addressed in a most cost-efficient way.

Project Support will be provided by a competitively selected Technical Consultancy and Backstopping contract, which will hire an international team of experts with experience in assisting PMU in such kinds of nation-wide, policy development and technology demonstration projects. The main task of the Project Support team of experts will be to assist the PMU in the tendering processes of services and works and providing the technical expertise for the efficient and effective management of the project. The dedication of these experts is not expected to be full-time, thus, they will not be required to permanently be in Mauritania; they will rather have a fluent and efficient communication with the PMU staff and will occasionally do field-missions to the country, especially for key moments and events, such as, at least, a kick-off mission, beginning of Component 3 batches and some workshops.

Short term national consultancies will be hired through competitive process targeting the studies, field-investigations and research needed to support the development of the project, as described in 2.1.

Short term international consultancies will be hired through competitive process in order to develop the knowledge base and the policy, regulatory, project design proposals of the Project, as described in 2.1.

1. MONITORING FRAMEWORK AND EVALUATION

UNDP will be responsible for monitoring and evaluation (M&E), including organizing project evaluations, approving annual implementation work plans and budget revisions, monitoring progress, identifying problems and suggesting remediating actions, facilitating timely delivery of project outputs and supporting the coordination and networking with other related initiatives and institutions in the country and in the region.

During implementation, proper care will be exercised to have adequate communication and co-ordination mechanisms in place to ensure that areas of common interest can be addressed in a cost-efficient way.

The project will be monitored through the following M&E activities. The M&E budget is provided in the table below.

Project start:

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

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

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

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

- **Quarterly:**

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

- **Annually:**

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

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

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

Periodic Monitoring through site visits:

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

Mid-term of project cycle:

The project is a medium sized-project, so there is no requirement to undergo an independent Mid-Term Review at the mid-point of project implementation.

End of Project:

An independent Terminal Evaluation will take place three months prior to the final Project Board meeting and will be undertaken in accordance with UNDP and GEF guidance. The terminal evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the mid-term review, if any such correction took place). The terminal evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental benefits/goals. The Terms of Reference for this evaluation will be prepared by the UNDP CO based on guidance from the Regional Service Centre and UNDP-GEF.

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

The relevant GEF Focal Area Tracking Tools will also be completed during the terminal evaluation.

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

Learning and knowledge sharing:

Results from the project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums.

The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation though lessons learned. The project will identify, analyse, and share lessons learned that might be beneficial in the design and implementation of similar future projects.

Finally, there will be a two-way flow of information between this project and other projects of a similar focus.

Communications and visibility requirements:

Full compliance is required with UNDP's Branding Guidelines. These can be accessed at <http://intra.undp.org/coa/branding.shtml>, and specific guidelines on UNDP logo use can be accessed at: <http://intra.undp.org/branding/useOfLogo.html>. Amongst other things, these guidelines describe when and how the UNDP logo needs to be used, as well as how the logos of donors to UNDP projects needs to be used. For the avoidance of any doubt, when logo use is required, the UNDP logo needs to be used alongside the GEF logo. The GEF logo can be accessed at: http://www.thegef.org/gef/GEF_logo. The UNDP logo can be accessed at <http://intra.undp.org/coa/branding.shtml>.

Full compliance is also required with the GEF's Communication and Visibility Guidelines (the "GEF Guidelines"). The GEF Guidelines can be accessed at: http://www.thegef.org/gef/sites/thegef.org/files/documents/C.40.08_Branding_the_GEF%20final_0.pdf. Amongst other things, the GEF Guidelines describe when and how the GEF logo needs to be used in project publications, vehicles, supplies and other project equipment. The GEF Guidelines also describe other GEF promotional requirements regarding press releases, press conferences, press visits, visits by Government officials, productions and other promotional items.

Where other agencies and project partners have provided support through co-financing, their branding policies and requirements should be similarly applied.

M& E workplan and budget

Type of M&E activity	Responsible Parties	Budget US\$ <i>Excluding project team staff time</i>	Time frame
Inception Workshop and Report	<ul style="list-style-type: none"> ▪ Project Manager ▪ UNDP CO, UNDP GEF 	Indicative cost: 10,000	Within first two months of project start up
Measurement of Means of Verification of project results.	<ul style="list-style-type: none"> ▪ UNDP GEF RTA/Project Manager will oversee the hiring of specific studies and institutions, and delegate responsibilities to relevant team members. 	To be finalized in Inception Phase and Workshop.	Start, mid and end of project (during evaluation cycle) and annually when required.
Measurement of Means of Verification for Project Progress on <i>output and implementation</i>	<ul style="list-style-type: none"> ▪ Oversight by Project Manager ▪ Project team 	To be determined as part of the Annual Work Plan's preparation.	Annually prior to ARR/PIR and to the definition of annual work plans
ARR/PIR	<ul style="list-style-type: none"> ▪ Project manager and team ▪ UNDP CO ▪ UNDP RTA ▪ UNDP EEG 	None	Annually
Periodic status/ progress reports	<ul style="list-style-type: none"> ▪ Project manager and team 	None	Quarterly

Type of M&E activity	Responsible Parties	Budget US\$ <i>Excluding project team staff time</i>	Time frame
Mid-term Evaluation	<ul style="list-style-type: none"> ▪ Project manager and team ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team) 	Not required as this project is a MSP	At the mid-point of project implementation.
Final Evaluation	<ul style="list-style-type: none"> ▪ Project manager and team, ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team) 	Indicative cost : 40,000	At least three months before the end of project implementation
Project Terminal Report	<ul style="list-style-type: none"> ▪ Project manager and team ▪ UNDP CO ▪ local consultant 	5,000	At least three months before the end of the project
Audit	<ul style="list-style-type: none"> ▪ UNDP CO ▪ Project manager and team 	Indicative cost per year: 5,000	Yearly
Visits to field sites	<ul style="list-style-type: none"> ▪ UNDP CO ▪ UNDP RCU (as appropriate) ▪ Government representatives 	For GEF supported projects, paid from IA fees and operational budget	Yearly
TOTAL indicative COST Excluding project team staff time and UNDP staff and travel expenses		US\$ 75,000 (+/- 5% of total budget)	

Audit Clause

Audit will be conducted according to UNDP Financial Regulations and Rules and applicable Audit policies.

2. LEGAL CONTEXT

Standard text has been inserted in the template. It should be noted that although there is no specific statement on the responsibility for the safety and security of the executing agency in the SBAA and the supplemental provisions, the second paragraph of the inserted text should read in line with the statement as specified in SBAA and the supplemental provision, i.e. “the Parties may agree that an Executing Agency shall assume primary responsibility for execution of a project.”

If the country has signed the [Standard Basic Assistance Agreement \(SBAA\)](#), the following standard text must be quoted:

This document together with the CPAP signed by the Government and UNDP which is incorporated by reference constitute together a Project Document as referred to in the SBAA [or other appropriate governing agreement] and all CPAP provisions apply to this document.

Consistent with the Article III of the Standard Basic Assistance Agreement, the responsibility for the safety and security of the implementing partner and its personnel and property, and of UNDP's property in the implementing partner's custody, rests with the implementing partner.

The implementing partner shall:

- a) put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried;
- b) assume all risks and liabilities related to the implementing partner's security, and the full implementation of the security plan.

UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.

The implementing partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via <http://www.un.org/Docs/sc/committees/1267/1267ListEng.htm>. This provision must be included in all sub-contracts or sub-agreements entered into under this Project Document.

If the country has not signed the SBAA, the following standard text must be quoted:

This document together with the CPAP signed by the Government and UNDP which is incorporated by reference constitute together the instrument envisaged in the [Supplemental Provisions](#) to the Project Document, attached hereto.

Consistent with the above Supplemental Provisions, the responsibility for the safety and security of the implementing partner and its personnel and property, and of UNDP's property in the implementing partner's custody, rests with the implementing partner.

The implementing partner shall:

- a) put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried;
- b) assume all risks and liabilities related to the implementing partner's security, and the full implementation of the security plan.

UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.

The implementing partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via <http://www.un.org/Docs/sc/committees/1267/1267ListEng.htm>. This provision must be included in all sub-contracts or sub-agreements entered into under this Project Document.

The following standard text for a global/ multi country and regional projects should be included:

This project forms part of an overall programmatic framework under which several separate associated country level activities will be implemented. When assistance and support services are provided from this Project to the associated country level activities, this document shall be the "Project Document" instrument referred to in: (i) the respective signed SBAA's for the specific countries; or (ii) in the Supplemental Provisions attached to the Project Document in cases where the recipient country has not signed an SBAA with UNDP, attached hereto and forming an integral part hereof.

This project will be implemented by the agency (name of agency) ("Implementing Partner") in accordance with its financial regulations, rules, practices and procedures only to the extent that they do not contravene the principles of the Financial Regulations and Rules of UNDP. Where the financial governance of an Implementing Partner does not provide the required guidance to ensure best value for money, fairness, integrity, transparency, and effective international competition, the financial governance of UNDP shall apply.

The responsibility for the safety and security of the Implementing Partner and its personnel and property, and of UNDP's property in the Implementing Partner's custody, rests with the Implementing Partner. The Implementing Partner shall: (a) put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried; (b) assume all risks and liabilities related to the Implementing Partner's security, and the full implementation of the security plan. UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.

The Implementing Partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via <http://www.un.org/Docs/sc/committees/1267/1267ListEng.htm>. This provision must be included in all sub-contracts or sub-agreements entered into under this Project Document.

IV. Annexes

1. **Risk Analysis.** Use the standard UNDP Atlas [Risk Log template](#). For UNDP GEF projects in particular, please outline the risk management measures including improving resilience to climate change that the project proposes to undertake.

P: Probability from 1 (low) to 5(high)

I: Impact from 1 (low) to 5 (high)

#	Description	Date identified	Type	Probability & Impact	Countermeasures / Mgt response	Owner	Submitted, updated by	Last Update	Status
1	Project implementation is a risk, as the country faced project cancellations in the past due to political instability. In addition, Mauritania is located in the very unstable part of the unsecured Sahara.		Political	P ³⁴ = 2 I ³⁵ = 4	The current political situation in the country is stable. However, this risk exists due to recent legislative election contests. To mitigate this risk, the project will build a wide coalition of partners and stakeholders whose interest in hybrid mini-grids promotion will likely to sustain, even in case of regime change. They include local businesses and communities, NGOs and international development agencies.	N/A		N/A	N/A
2	The success of this project will be determined to a large degree by adoption and effective enforcement of the proposed policies. Lack of political support may jeopardize the		Policy	P = 1 I = 4	Initial consultations with the Government of Mauritania have indicated an interest and a willingness to establish a Renewable Energy Support Unit and an Investment Grant Mechanism for	Project Board			

³⁴ Probability from 1 (low) to 5(high)

³⁵ Impact from 1 (low) to 5 (high)

	achievement of immediate results and over-all impact.				Renewable Energy projects. The political will to support this project is strong.				
3	The crack of Solar panels or wind turbines is quite common and could result to systems breaking down. Insufficient quality of locally produced equipment leading to early breakdown of the systems and dwindling consumer confidence in the technology.		Technology	P= 2 I= 5	The project intends to use proven feasible, affordable and adapted technologies while replicating solutions that have been successfully introduced in several countries in the region. In this respect, the project will build partnership with companies established in the country.	Project Board			
4	Widespread poverty and lack of sustainable source of income resulting in low ability to pay for energy supply services. There is also a lack of ability to finance projects for SMEs.		Financial	P = 3 I= 4	The project voluntarily decided to work with already existing mini-grids. In these areas, there is already a capacity and willingness to pay from end-users. On the other hand, the combination of the power utility business model and private sector business model through PPP (public private partnerships) will reduce the financial risk from both side (utility side and private sector side).	Project Board			
5	In Mauritania, hybrid systems will have to compete with subsidized and locally available diesel alternatives, such as Multifunctional platforms (MFP) running on diesel. Without additional		Market	P = 4 I= 4	Introduction of financial viable tariff for hybrid diesel/RE-based mini-grids will be a cornerstone instrument of the proposed policy package and business model, aimed specifically at	Project Board			

	incentives, hybrid plants will likely to remain uncompetitive.				addressing this market risk by leveling the playing field for RE against other available alternatives. Financial commitments will be secured to sustain the policy package and business model operation beyond the GEF proposed project duration from the Government and other donors.				
6	Climate change is predicted to cause changes and increase variability of Mauritanian solar and wind patterns. Higher temperatures may cause overheat of solar panels and reduce the productivity of these panels. And stronger wind may cause destruction and broken of panels.		Climate	P = 2 I= 2	In the case of extreme climate change, regular maintenance and inspection will help to ensure the performance of solar and wind solutions, overheat or destruction. The choice of resistant and well-adapted materials will also be of importance. Both of these actions are important to protect from climate risks.	Project Board			

2. **Terms of Reference:** *TOR for key project personnel should be developed and attached.*

Project Board

Duties and responsibilities:

The Project Board is the main body to supervise the project implementation in accordance with UNDP rules and regulations and referring to the specific objectives and the outcomes of the project with their agreed performance indicators.

The main functions of the Board are:

- General monitoring of project progress in meeting its objectives and outcomes and ensuring that they continue to be in line with national development objectives;
- To provide strategic leadership and serve as coordination mechanisms for various partners involved;
- Facilitating the co-operation between the different Government entities, whose inputs are required for successful implementation of the project, ensuring access to the required information and resolving eventual conflict situations raising during the project implementation when trying to meet its outcomes and stated targets;
- Supporting the elaboration, processing and adoption of the required institutional, legal and regulatory changes to support the project objectives and overcoming of related barriers;
- Facilitating and supporting other measures to minimize the identified risks to project success, remove bottlenecks and resolve eventual conflicts;
- Approval of the annual work plans and progress reports, the first plan being prepared at the outset of project implementation;
- Approval of the project management arrangements; and
- Approval of any amendments to be made in the project strategy that may arise due to changing circumstances, after careful analysis and discussion of the ways to solve problems.

National Focal Point

As a representative of the Government and the project's executing agency, the National Focal Point has the main responsibility to ensure that the project is executed in accordance with the Project Document and the UNDP guidelines for direct implemented projects.

His/her main duties and responsibilities include:

- Coordinate and guide the work of the Project Manager with the work of the Ministry Of Energy, Finance and Budget through meetings at regular intervals to receive project progress reports and provide guidance on policy issues;
- Certifying the annual and, as applicable, quarterly work plans, financial reports and ensuring their accuracy and consistency with the project document and its agreed amendments;
- Taking the lead in developing linkages with the relevant authorities at national, provincial and governmental level and supporting the project in resolving any institutional or policy related conflicts that may emerge during its implementation.

Structure and Reimbursement of Costs

Following an agreement at country level, the Project Board will be co-chaired by Ministry of Environment and one UN agency per year alternately. APAUS, as the key governmental agency in charge of decentralized energy solutions, will ensure that other governmental agencies are duly consulted and involved as per their mandate. The Board may also include representatives of other stakeholders, by ensuring, however, that the Board will remain sufficiently lean to facilitate its effective operation. Other participants can be invited into the Board meetings at the decision of the Board.

The costs of the Board's work shall be considered as the Government's or other project partners' voluntary in-kind contribution to the project and shall not be paid separately by the project. Members of the Board are also not eligible to receive any monetary compensation from their work as experts or advisers to the project.

Meetings

It is suggested that the Board will have regular meetings, twice a year, or more often if required. A tentative schedule of the Board meetings will be agreed as a part of the annual work plans, and all representatives of the Board should be notified again in writing 14 days prior to the agreed date of the meeting. The meeting will be organized provided that the executing agency, UNDP and at least 2/3 of the other members of the Board can confirm their attendance. The project manager shall distribute all materials associated with the meeting agenda at least 5 working days in prior to the meeting.

Project Management Unit

Project Manager

Duties and responsibilities:

Operational project management in accordance with the Project Document and the UNDP guidelines and procedures for direct implemented projects, including:

- General coordination, management and supervision of project implementation;
- Managing the procurement and the project budget under the supervision of UNDP to assure timely involvement of local and international experts, organisation of training and public outreach, purchase of required equipment etc. in accordance with UNDP rules and procedures;
- Submission of annual Project Implementation Reviews and other required progress reports (such QPRs) to the PSC and the UNDP in accordance with the section "Monitoring and Evaluation" of the Project Document;
- Supervising and coordinating the contracts of the experts working for the project;
- As applicable, communicating with the project's national and international partners and attracting and follow up additional financing in order to fulfil the project objectives; and
- Ensuring otherwise successful completion of the project in accordance with the stated outcomes and performance indicators summarized in the project's results framework and within the planned schedule and budget.

Expected Qualifications:

In evaluating the candidates applying for the position of the project manager, it is highlighted that a committed, full-time project manager with adequate outreach, results oriented and networking skills is absolutely essential for the success of the project. Therefore, a specific emphasis in the evaluation will be placed on the demonstrated and proven capacity and results of the applicants to: i) engage the key stakeholders into constructive discussion about future development of hybrid mini-grids; ii) to guide and supervise the studies and specifications done and effectively co-operate with the international experts who are engaged to support this work; iii) to lead the local staff to effectively support and supervise the project activities; iv) to present the results, findings and recommendations in a convincing

manner to key policy-makers and government bodies for the development of hybrid mini-grids; and iv) to identify areas of future replication.

Contributing to the requirements above, the candidates applying for the position are expected to have:

- Advanced university degree and at least 7 years of professional experience or university degree with 10 years of professional experience in management in the specific areas of the project is dealing with, including solid knowledge of the state-of-the-art approaches and best practices with Renewable Energy projects and rural electrification;
- Experience in managing projects of similar complexity and nature, including demonstrated capacity to actively explore new, innovative implementation and financing mechanisms to achieve the project objective;
- Demonstrated experience and success in the engagement of and working with the private sector, national and local government agencies, and NGOs, creating partnerships and leveraging financing for activities of common interest;
- Good analytical and problem-solving skills and the related ability for adaptive management with prompt action on the conclusion and recommendations coming out from the project's regular monitoring and self-assessment activities as well as from periodic external evaluations;
- Ability and demonstrated success to work in a team, to effectively organise it, and to motivate its members and other project counterparts to effectively work towards the project's objective and expected outcomes;
- Good communication skills and competence in handling project's external relations at all levels;
- Fluent/good knowledge of French and English languages; and
- Familiarity and prior experience with UNDP and GEF requirements and procedures are considered as an asset

Administrative Manager

Duties and responsibilities:

Supporting the project manager in the implementation of the project, including:

- Responsibility for logistics and administrative support of project implementation, including administrative management of the project budget, required procurement support, etc.
- Maintaining up to date business and financial documentation, in accordance with UNDP and other project reporting requirements;
- Organizing meetings, business correspondence and other communications with the project partners;
- Managing the projects files and supporting the project manager in preparing the required financial and other reports required for monitoring and supervision of the project progress;
- Supporting the project manager in managing contracts, in organizing correspondence and in ensuring effective implementation of the project otherwise.

Expected Qualifications:

- University degree experience in economics, business administration or similar with at least 5 years of professional
- Fluent/good knowledge of French and English languages
- Demonstrated experience and success of work in a similar position
- Good administration and interpersonal skills
- Ability to work effectively under pressure

- Good computer skills

Administrative assistant

Duties and responsibilities

Supporting the project Administrative assistant, including:

- Coordinating logistics and administrative support of project implementation, including administrative management of the project budget, required procurement support, etc.
- Maintaining up to date business and financial documentation, in accordance with UNDP and other project reporting requirements;
- Organizing meetings, minute taking, business correspondence and other communications with the project partners;
- Managing the projects files and supporting the project manager in preparing the required financial and other reports required for monitoring and supervision of the project progress;
- Supporting the project manager in managing contracts, in organizing correspondence and in ensuring effective implementation of the project otherwise.

Expected Qualifications:

- University degree experience in economics, business administration or similar with at least 5 years of professional
- Fluent/good knowledge of French and English languages
- Demonstrated experience and success of work in a similar position
- Good administration and interpersonal skills
- Ability to work effectively under pressure
- Good computer skills

International Technical Advisor

Duties and responsibilities

Under the overall supervision of the Project Manager, the non-resident Technical Adviser will:

- Work closely with the PM in coordinating and facilitating inputs of government agencies, partner organizations, scientific and research institutions, subcontractors, and national and international experts in a timely and effective manner;
- Provide guidance and assistance to the PM and project staff to ensure that the project activities conform to the approved project document;
- Assist the PM during the initial 2 months of the project, in the preparation of an “inception report” which will elaborate on the project Logical Framework Matrix and planned project activities, the 1st year Annual Work Plan and Budget, ToRs for key project staff, and an M&E plan;
- Assist the PMU in development of relevant ToRs and recruitment/mobilization of qualified national and international experts and organizations as needed to provide specific consultancy and engineering services;
- Formulate procedures for any financial mechanism and support its implementation;

- In close cooperation with the PMU and UNDP's Focal Point on Energy and Environment, and in consultation with the project partner organizations and stakeholders, prepare Annual Project Work Plans to be agreed upon by the Project Board (PB);
- Provide "on-the-job" technical guidance and mentoring to the PMU in order to strengthen their capacity to effectively implement the technical aspects of the project;
- Support the PM in reporting to the PB on the progress of project implementation and achievement of project results in accordance with the project's logical framework matrix;
- Support the PMU in project-related meetings, as required;
- Review reports of national and international consultants, project budget revisions, and administrative arrangements as required by UNDP/GEF procedures;
- Assist the PM in the development of a concrete Monitoring and Evaluation Plan at the outset of the project (within inception report);
- Support the PM in preparing project progress reports, information releases, as well as monitoring and review reports in accordance with UNDP/GEF monitoring and evaluation rules and procedures;
- Support the PM in the preparation and implementation of mid-term review and terminal Independent Evaluation Missions (TOR's, identification and recruitment of appropriate candidates, organization of missions, joint field missions and discussion with evaluators, etc.);
- Support UNDP CO staff on their annual monitoring visits to project sites.

Expected Qualifications:

- Postgraduate degree in energy/renewable energy development.
- Minimum ten years of experience in implementing renewable energy projects in combination with knowledge of economic and financial analysis, institutional, regulatory and policy frameworks;
- Good knowledge of and experience Climate Change issues, operational modalities and familiarity with UNDP-GEF procedures would be an advantage;
- Familiarity with UNDP rules, regulations and administrative procedures would be an advantage;
- Prior knowledge and experience of the political, social and environmental factors and issues related to energy development and climate change mitigation in African Developing States;
- Computer proficiency, especially related to professional office software packages;
- Excellent drafting and communication skills.
- Fluency in English and French

3. Special Clauses. *In case of government cost-sharing through the project which is not within the CPAP, the following 10 clauses should be included:*

1. The schedule of payments and UNDP bank account details.
2. The value of the payment, if made in a currency other than United States dollars, shall be determined by applying the United Nations operational rate of exchange in effect on the date of payment. Should there be a change in the United Nations operational rate of exchange prior to the full utilization by the UNDP of the payment, the value of the balance of funds still held at that time will be adjusted accordingly. If, in such a case, a loss in the value of the balance of funds is recorded, UNDP shall inform the Government with a view to determining whether any further financing could be provided by the Government. Should such further financing not be available, the assistance to be provided to the project may be reduced, suspended or terminated by UNDP.
3. The above schedule of payments takes into account the requirement that the payments shall be made in advance of the implementation of planned activities. It may be amended to be consistent with the progress of project delivery.
4. UNDP shall receive and administer the payment in accordance with the regulations, rules and directives of UNDP.
5. All financial accounts and statements shall be expressed in United States dollars.
6. If unforeseen increases in expenditures or commitments are expected or realized (whether owing to inflationary factors, fluctuation in exchange rates or unforeseen contingencies), UNDP shall submit to the government on a timely basis a supplementary estimate showing the further financing that will be necessary. The Government shall use its best endeavours to obtain the additional funds required.
7. If the payments referred above are not received in accordance with the payment schedule, or if the additional financing required in accordance with paragraph () above is not forthcoming from the Government or other sources, the assistance to be provided to the project under this Agreement may be reduced, suspended or terminated by UNDP.
8. Any interest income attributable to the contribution shall be credited to UNDP Account and shall be utilized in accordance with established UNDP procedures.

In accordance with the decisions and directives of UNDP's Executive Board:

The contribution shall be charged:

- (a) [...]cost recovery for the provision of general management support (GMS) by UNDP headquarters and country offices
 - (b) Direct cost for implementation support services (ISS) provided by UNDP and/or an executing entity/implementing partner.
9. Ownership of equipment, supplies and other properties financed from the contribution shall vest in UNDP. Matters relating to the transfer of ownership by UNDP shall be determined in accordance with the relevant policies and procedures of UNDP.
 10. The contribution shall be subject exclusively to the internal and external auditing procedures provided for in the financial regulations, rules and directives of UNDP.

4. Annexes

STANDARD LETTER OF AGREEMENT BETWEEN UNDP AND THE GOVERNMENT FOR THE PROVISION OF SUPPORT SERVICES

Dear [*name of government official*],

1. Reference is made to consultations between officials of the Government of **the Republic of Mauritania** (hereinafter referred to as “the Government”) and officials of UNDP with respect to the provision of support services by the UNDP country office for nationally managed programmes and projects. UNDP and the Government hereby agree that the UNDP country office may provide such support services at the request of the Government through its institution designated in the relevant programme support document or project document, as described below.
2. The UNDP country office may provide support services for assistance with reporting requirements and direct payment. In providing such support services, the UNDP country office shall ensure that the capacity of the Government-designated institution is strengthened to enable it to carry out such activities directly. The costs incurred by the UNDP country office in providing such support services shall be recovered from the administrative budget of the office.
3. The UNDP country office may provide, at the request of the designated institution, the following support services for the activities of the programme/project:
 - (a) Identification and/or recruitment of project and programme personnel;
 - (b) Identification and facilitation of training activities;
 - (a) Procurement of goods and services;
4. The procurement of goods and services and the recruitment of project and programme personnel by the UNDP country office shall be in accordance with the UNDP regulations, rules, policies and procedures. Support services described in paragraph 3 above shall be detailed in an annex to the programme support document or project document, in the form provided in the Attachment hereto. If the requirements for support services by the country office change during the life of a programme or project, the annex to the programme support document or project document is revised with the mutual agreement of the UNDP resident representative and the designated institution.
5. The relevant provisions of the [*Insert title and date of the UNDP standard basic assistance agreement with the Government*] (the “SBAA”), including the provisions on liability and privileges and immunities, shall apply to the provision of such support services. The Government shall retain overall responsibility for the nationally managed programme or project through its designated institution. The responsibility of the UNDP country office for the provision of the support services described herein shall be limited to the provision of such support services detailed in the annex to the programme support document or project document.
6. Any claim or dispute arising under or in connection with the provision of support services by the UNDP country office in accordance with this letter shall be handled pursuant to the relevant provisions of the SBAA.
7. The manner and method of cost-recovery by the UNDP country office in providing the support services described in paragraph 3 above shall be specified in the annex to the programme support document or project document.
8. The UNDP country office shall submit progress reports on the support services provided and shall report on the costs reimbursed in providing such services, as may be required.

9. Any modification of the present arrangements shall be effected by mutual written agreement of the parties hereto.

10. If you are in agreement with the provisions set forth above, please sign and return to this office two signed copies of this letter. Upon your signature, this letter shall constitute an agreement between your Government and UNDP on the terms and conditions for the provision of support services by the UNDP country office for nationally managed programmes and projects.

Yours sincerely,

Signed on behalf of UNDP
Mario Samaja
UN Resident Coordinator and
UNDP Resident Representative

For the Government
[Name/title]
[Date]

Attachment

DESCRIPTION OF UNDP COUNTRY OFFICE SUPPORT SERVICES

1. Reference is made to consultations between **Ministry of Environment & Sustainable Development / APAUS** the institution designated by the Government of the Republic of Benin and officials of UNDP with respect to the provision of support services by the UNDP country office for the nationally managed project **number** on **“Promoting Sustainable Mini-grids in Mauritanian provinces through hybrid technologies”**.

2. In accordance with the provisions of the letter of agreement signed on *[insert date of agreement]* and the programme support document *[or project document]*, the UNDP country office shall provide support services for the Programme *[or Project]* as described below.

3. Support services to be provided:

Support services (insert description)	Schedule for the provision of the support services	Cost to UNDP of providing such support services (where appropriate)	Amount and method of reimbursement of UNDP (where appropriate)
1.			
2.			
3.			

4. Description of functions and responsibilities of the parties involved: