United Nations Development Programme

Country: Republic of Mali

PROJECT DOCUMENT

Project Title: Promoting sustainable electricity generation in Malian rural areas through hybrid technologies.

UNDAF Outcome(s): The vulnerable population, especially women and young ones, benefit from productive capacities in a (natural) healthy environment favourable to poverty reduction.

UNDP Strategic Plan Focus Area: (1) Growth and development are inclusive and durable, generating the required productive capacity for job creation and existence means of the poor and excluded.

Expected CP Outputs: (4) The vulnerable groups (young ones, women, displaced, ..) implement adaptation and climate-resilient activities, contributing to revitalising local economies ; (5) To ensure that standards and environmental concerns in development policies are effective ; and (6) State and territorial communities implement their action plans aimed at reducing disaster and improve sanitation.

UNDP Strategic Plan Environment and Sustainable Development Primary Outcome: Mainstreaming environment and energy.

UNDP Strategic Plan Secondary Outcome: Mobilising environmental finance.

Executing Entity/Implementing Partner: Ministry of Energy and Water.

Implementing Entity/Responsible Partner: United Nations Development Programme.

Brief Description: The objective of the project is to promote the implementation of small-scale renewable energy/PV-based mini-grids in a hybrid system with MFPs to targets off-grid rural electrification. It proposes to put in place an enabling environment for the development of these hybrid systems and develop a suitable business model and financial instruments for their viability and replication. It will do so by leveraging significant private sector investment over its four-year implementation period to pilot 15 villages having an initial total installed capacity of 147 kW of PV. Over the project period, the 15 pilots scheduled for implementation will generate a total of 416 MWh of electricity. Moving forward, these 15 pilots will have an annual generation of 244 MWh that would be sustained over an expected 20-year projected life of the PV systems, resulting in the cumulative avoidance of 4,216 tCO_2.

Under the assumption of great interest generated in renewable energy-based mini-grids for rural electrification during project implementation and given the conducive environment for investment that the project would have created, it is highly likely that many more such mini-grids will be built over a post-project period of 10 years, exceeding by several times the number installed during the 4-year project implementation. Thus, the indirect post-project emission reduction estimates related to only the additional capacity can be computed to be 116,462 tons of CO_2 avoided, which translates into an abatement cost of $ 10 of GEF funds per tCO_2 reduced. The project will achieve this target by introducing a conducive regulatory framework and by establishing a financial support scheme that together will facilitate hybrid PV/MFP rural electrification through private sector participation in the country.

Programme Period:	2011-2015
Atlas Award ID:	00089433
Project ID:	00095678
PIMS #	4903
Start date:	July 2016
End Date:	June 2020
Management Arrangements:	NIM
PAC Meeting Date:	TBD

Total resources	$25,171,137
Regular	
GEF	$1,158,744
UNDP (TRAC)	$500,000
Other	
• Government	$13,012,393
• UNDP	$10,500,000

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

AfDB	African Development Bank
AER-Mali	Agence Nationale des Energies Renouvelables du Mali
AMADER	Agence Malienne pour le Développement de l'Energie Domestique et de l'Electrification Rurale
ANADEB	Agence Nationale de Développement des Biocarburants
APR	Annual Project Review
CNESOLER	Centre National de l'Energie Solaire et des Energies Renouvelables
CO	UNDP Country Office
CO_2	Carbon dioxide
DNE	Direction Nationale de l'Energie
EDM	Electricité du Mali
EIA	Environmental Impact Assessment
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FSM	Financial Support Mechanism
GEF	Global Environment Facility
GHG	Greenhouse Gas
IPP	Independent Power Producer
kW	Kilowatt
kWh	Kilowatt-hour
LED	Light-Emitting Diode
M&E	Monitoring and Evaluation
MEE	Ministère de l'Energie et de l'Eau
MFI	Multilateral Financial Institution
Mtoe	Million tons of oil equivalent
MW	Megawatt
MWh	Megawatt-hour
NAMA	Nationally Appropriate Mitigation Actions
NGO	Non-Governmental Organization
PANA	National Adaptation Programme of Action for Climate Change
QPR	Quarterly Progress Report
PIF	Project Identification Form
PIR	Project Implementation Review
PMU	Project Management Unit
PPA	Power Purchase Agreement
PPG	Project Preparation Grant
REF	Rural Electrification Fund
RSC	UNDP Regional Service Centre
REDD	Reducing Emissions from Deforestation and forest Degradation
RTA	UNDP Regional Technical Adviser

SE4ALL	Sustainable Energy for All
toe	Tons of oil equivalent
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
$[1]	United States dollar

[1] 1 $ = 500 FCFA

1. SITUATION ANALYSIS

The Republic of Mali is a land-locked country located in West Africa, with Bamako as its capital. Two major rivers (River Senegal, 1,700-km long, half of which flows through Mali and River Niger, 4,200-km long, with 1,700 km flowing through Mali) cross the country of 14.5 million inhabitants (2009 Census – estimated at 16.9 million in 2013), consisting of 65% rural and 35% urban, living in an area that covers 1.2 million km2. The country shares a 7,200 km border with seven countries (Fig. 1): Algeria to the North, Niger in the East, Burkina Faso to the South-East, Côte d'Ivoire and Guinea to the South, and with Mauritania and Senegal to the West. The population density varies from 90 inhabitants/km2 in the central Niger delta to 0.5 inhabitant/km2 in the northern Sahara region, with more than 90% of the population living in the southern part of the country.

The country is characterised by 4 distinct agro-climatic zones: i) The pre-Guinean of sub-humid zone (75 000 km2, 6% of the total area) to the South that consists of woodlands and forests and where annual rainfall exceeds 1,200 mm; ii) The Sudan zone (215 000 km2, 17% of the total area) in the Centre with more or less dense vegetation cover and where annual rainfall is 600 to 1,200 mm; iii) The Sudanese zone (320 000 km2, 26% of the total area) in the North, where annual rainfall is 200 to 600 mm; and iv) The Sahara desert zone (632,000 km2) covering 51% of the country further North where the annual rainfall is less than 200 mm.

The dry season lasts from March through June, followed by the rainy season from June through September. October through February witnesses dry winds (Harmattan) blowing from the Sahara desert. Temperatures vary between 24°C in January to 35°C in May.

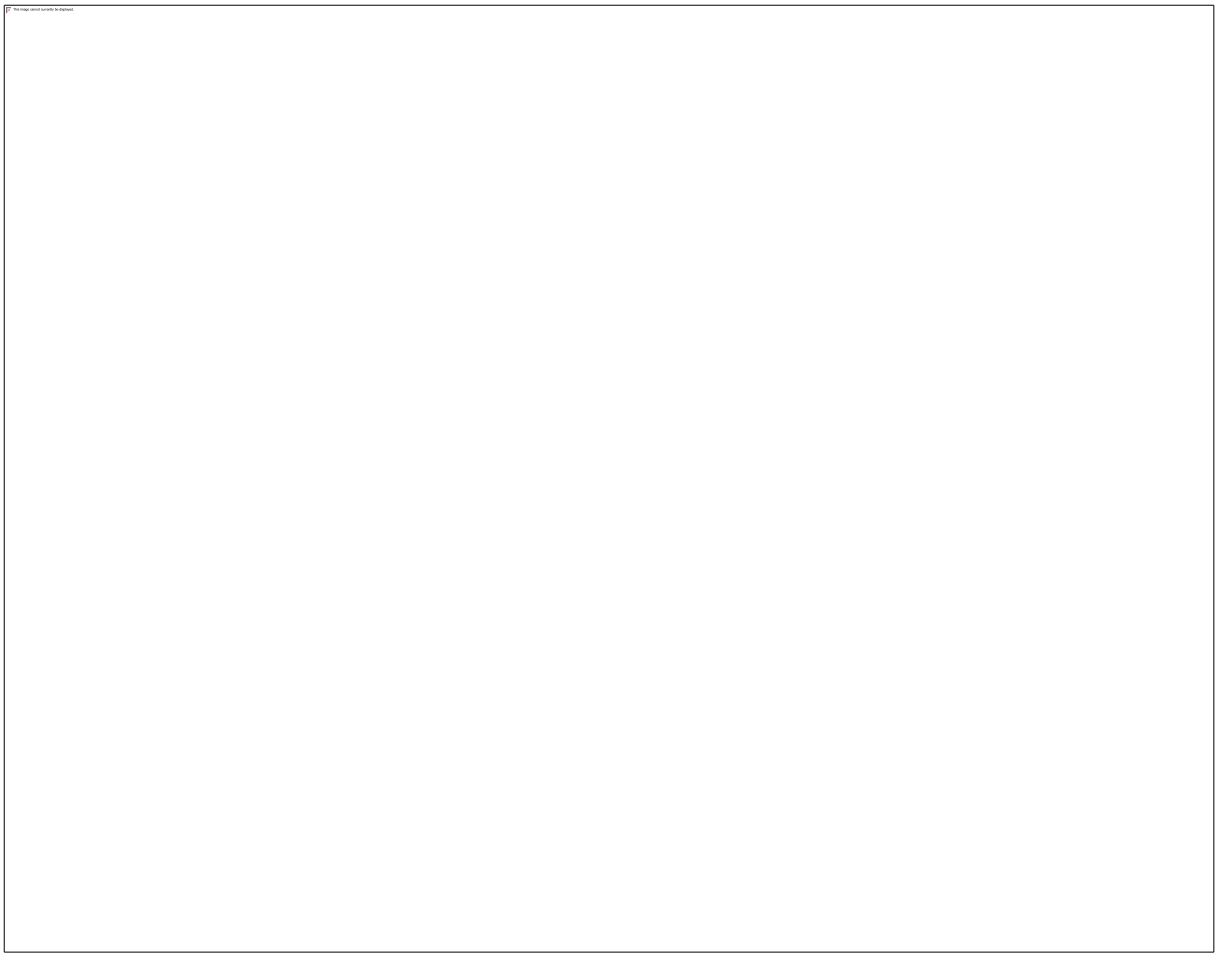

Fig. 1: Map of Mali

With a per capita GDP of $ 715 (National Institute of Statistics, 2013), Mali is considered a low income country; in 2010, 43.6% of the population lived in poverty. It is heavily dependent on resources from the MFI, via its Extended Credit Facility, and other donors, to help reduce macroeconomic imbalances. In 2012, despite the international crisis, economic activity remained strong, supported by higher investments in agriculture and the mining sector. Real GDP grew by 3.9% in 2011 to reach 4.8% in 2012, compared with 1.9% in 2010 and inflation is presently 11.9% compared to 12.8% in 2012.

The country is largely dependent on agriculture and mineral production, with gold (the main export), uranium, phosphates, kaolinite, salt and limestone being most widely exploited - Mali is estimated to have in excess of 17,400 tonnes of uranium. Most of the population (more than 80%) works in the agriculture and livestock sector; cotton, for example, is the country's major foreign currency earner. Malian agriculture is extensive, dominated by a traditional farming system and highly dependent on rainfall for 90% of the area under crops; the area of irrigated land is approx. 1,000,000 hectares, targeting mainly rice cultivation in the Niger Delta. Agriculture (millet, rice, corn, sorghum, etc.) accounts for about 45% of GDP, 21% of exports, and over 80% of the active labour force. However, as is the case in most African countries, agriculture is essential for the attainment of the goals of poverty reduction and food security.

In 2002, the Government decided to put in place a Strategic Framework for the Fight against Poverty (Cadre Stratégique de Lutte contre la Pauvreté – CSLP) to put all sectoral policies aimed at poverty reduction under one umbrella. It proposed innovative actions to deal with the deep roots of poverty and strengthening the capacity of the poor to take advantage of economic opportunities. Since 2007, CSLP has been replaced by the Strategic Framework for Growth and Poverty Reduction (Cadre Stratégique pour la Croissance et la Réduction de la Pauvreté - CSCRP) that highlights, among others, the important role that access to energy services can play both in addressing growth and poverty reduction issues by providing opportunities for income-generating activities, especially to the vast majority living in the rural areas, where only approx. 17 % of the population has access to modern energy services. In order to achieve this, CSCRP 2012 – 2017, supported by the African Development Bank, proposes to promote the development of renewable sources of energy (biofuel, hydro, solar and wind) for electricity generation at least cost.
The primary energy supply of Mali in 2012 consisted of 77% biomass (Fig. 2), mainly in the form of wood and charcoal for domestic use, 20% petroleum products and 3% electricity, mainly from hydropower.

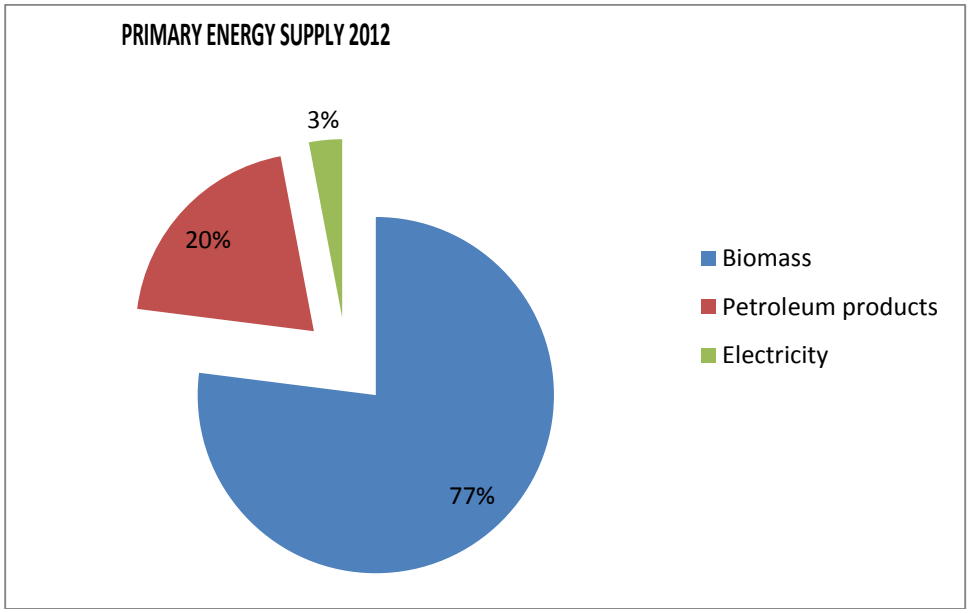

Fig. 2: Primary Energy Supply (2012)

On the energy consumption side (Fig. 3), households consume 69 % of Mali's energy, (road) transport 21 %, industry (mainly mining) 2 % and other sectors 8 % (2012 figures). Approx. 80% of household energy needs are met by biomass resources (wood and charcoal), which cause health problems among the rural population through indoor air pollution, and is a key driver for environmental degradation such as deforestation and land degradation. All this results in high GHG emissions, deforestation and environmental degradation.

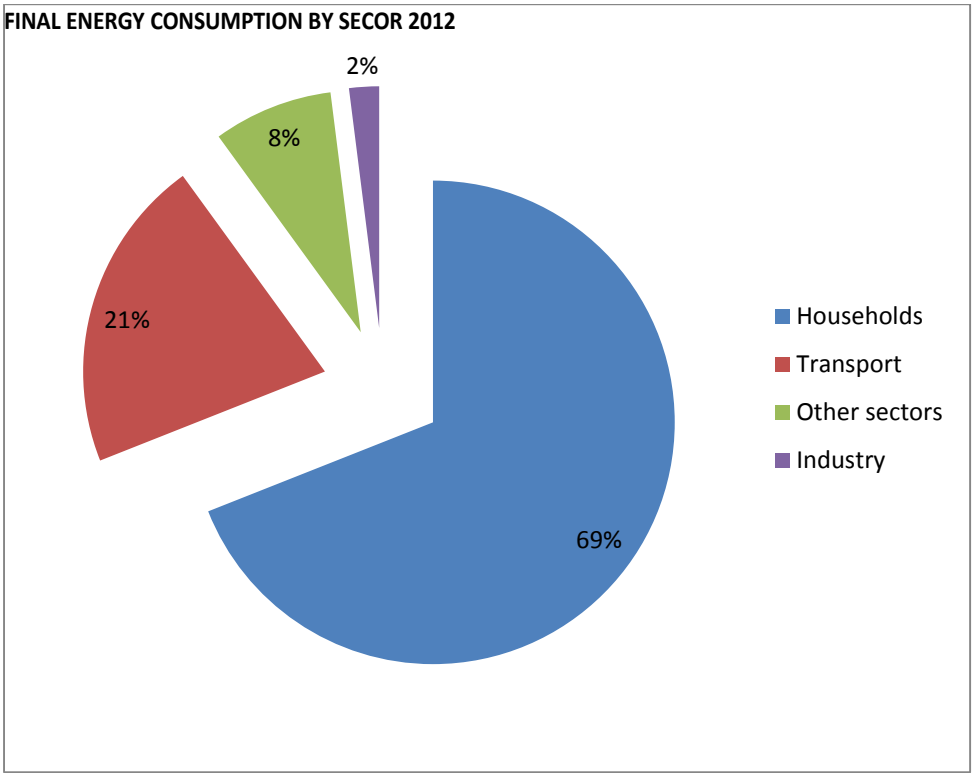

Fig. 3: Final Energy Consumption by Sector (2012)

Mali has a high renewable energy (RE) potential, especially for Solar, Hydro, Wind and Biomass/Biofuel. While substantial hydropower has been developed by Electricité du Mali, in collaboration with other partners, with almost 97% of the country's hydropower potential on grid, solar PV, wind power and biofuels are still making baby steps, thus accounting for less than 3% of the total installed capacity.

Electricité du Mali (EDM – 66% Government-owned + 36% owned by Industrial Promotion Services, West Africa -the West African affiliate of the Aga Khan Fund for Economic Development (AKFED)), the national utility (Table 1), operates 150 MW of diesel-based generation and 174 MW of hydropower, of which 253 MW operate on-grid, with the balance being on isolated grids. It also has access to a negotiated quota of 104 MW from the 200 MW Manantali hydroelectric power plant located at the Malian-Senegalese-Mauritanian border operated by the IPP ESKOM-ENERGIE-MANATALI (EEM - a local branch of the South African Eskom SA).

An estimated 20% of the country's fuel import (927 ktep in 2013/2014) is used for diesel-based electricity generation. Total annual electricity generation in 2013 was 1,420 GWh, mainly used for electrification of urban and peri-urban areas covering some 60 urban municipalities through the national grid and 275 isolated grids, 20 of which are operated directly by EDM and the remaining 255 being under AMADER operation. Grid extension into rural areas is limited and the country is too poor, too big and too sparsely populated to expect such extension to happen on any meaningful scale in the coming years. Rural electrification, in so far it has been achieved, is through mainly diesel-operated mini-grids,

although PV-generated electricity is gradually becoming more available; however, the quantity, quality, reliability and affordability of this rural electricity remain problematic.

Table 1: EDM At-a-Glance, 2010 – 2013

Year / Data	2010	2011	2012	2013
Generation - Grid, MWh	1,063,463	1,142,019	1,143,836	1,352,428
Generation – Isolated Mini-Grids, MWh	149,315	156,750	120,376	67,929*
Sale, MWh	945,890	1,032,900	1,012,884	1,102,496
Losses (%) (approx. 15% technical and 5% non-technical).	22	20	20	20
Low Voltage Grid, km	3,475	3,676	3,739	3,782
Medium Voltage Grid, km	2,353	1,562	1,680	1,680
High voltage Grid, km	3,028	3,065	3,228	3,283
Low Voltage Consumers	231,864	259,438	288,382	311,952
Medium Voltage Consumers	1,490	1,570	1,660	1,669

*Decrease in isolated generation in 2013 is due to some villages located near the border being supplied from the Cote d'Ivoire grid.
Source: EDM-SA Annual Reports.

The electricity system in Mali consists of an interconnected grid serving 26 localities, including Bamako and some regional capitals like Kayes, Koulikoro, Sikasso, Ségou and towns like Fana, Diola, Kita, Mananatali, Koutiala. EDM also operates 20 isolated grids (e.g. Mopti - 9.5 MW, Bougouni - 3.8 MW, Kidal - 4.3 MW, Tombouctou - 5 MW, etc.) and 2 load centres (Kadiolo and Zegoua) connected to the Cote d'Ivoire medium voltage grid, with a guaranteed 30 MW supply. The transmission grid consists of a 150 kV line connecting Bamako to Fana and Ségou to the east and a 225 kV line from Manantali, also connecting Bamako with Kayes and Kita to the west. The electricity in the mini-grids is generated at an average cost of 47 US Cents/kWh normally for only 5-7 hours per day. While tariffs in the rural areas are not directly subsidised, they are established by AMADER to make the services affordable to the consumers; this is achieved through providing the private grid operators (e.g. KAMA-SA, Yelen Kura, Access, etc.) with an upfront investment subsidy of 80%.

With a third of its 16.9 million population living in urban areas (a third of which in Bamako), approximately only a quarter of the Malian population is provided with electricity, with a share of those in the rural areas amounting to only 15%. The electricity sector is characterized by a high dependence on oil, the importation of which is constantly on the rise due to the demand of a fast growing population (doubling every 25 years) and economic growth. This exposes the economy to the volatility of oil prices and puts it under foreign reserves pressure. Local energy service providers in rural areas such as MFPs (Multifunctional Platforms) and AMADER that operate isolated fossil fuelled mini-grids are particularly affected by rising and volatile fuel prices, as well as considerable fuel transport costs within the country. This results in the bulk of the rural population having to satisfy their needs for "modern" energy services through very expensive means. It is reported that rural households spend an average $ 18 per month to purchase kerosene, candles and disposable batteries. As per the IMF (2013), these sources of energy result in $ 1.5/kWh, when aggregated.

The tariff structure for EDM consumers is provided in Table 2 below. Technical losses in the EDM grid in 2014 were approx. 15% while non-technical (commercial) losses due to non-payment of bills and/or electricity theft amounted to 5%, thus indicating that the general capacity of consumers to pay their electricity bills is fairly good. It is true that, in the urban areas where the electricity tariff is regulated, there is a social tariff of between 12 and 19 US Cents/kWh that is applied to consumers depending to their social category, while the average cost of delivery to consumers is 24 US Cents/kWh. This high unit cost reflects factors specific to rural areas in Mali, viz. high costs of diesel due to transportation

and logistical costs, low engine efficiency related to small-size, sub-optimal load factor, high cost of maintenance, etc. However, the tariff is set by AMADER at an affordable level, thus necessitating a substantial subsidy from the Government's Rural Electrification Fund (see below). In this connection, a recent IMF publication (Source: Energy Subsidy Reform in Sub-Saharan Africa: Experiences and Lessons, 2013) indicates that the subsidy towards the whole energy sector (not only electricity) represents almost 1% of the GDP in Mali.

Table 2: EDM Electricity Tariff Structure (2014)

Consumer Category	Tariff (US Cents/kWh)
Social tariff (metering limited to 5 A):	
Tranche 1 : 0 – 50 kWh/month	0.118
Tranche 2 : 51 – 100 kWh/month	0.188
Tranche 3 : 101 – 200 kWh/month	0.258
Tranche 4 : > 200 kWh/month	0.306
Normal tariff (metering > 5 A) :	
Tranche 1 : 0 – 200 kWh/month	0.258
Tranche 2 : >200 kWh/month	0.306
Public lighting :	
Initial 120 hrs of usage	0.27
Additional usage > 120 hrs	0.186

Rural electrification based on isolated mini-grids is the responsibility of AMADER (Agence Malienne pour le Développement de l'Energie Domestique et de l'Electrification Rurale (Agency for the Development of Household Energy and Rural Electrification). AMADER presently operates 255 isolated diesel-based mini-grids throughout the country, ranging from 50 kW to 250 kW. It installs the generation capacity and builds the distribution system; however, it sub-contracts with the private sector for the operation of the mini-grid, with each sub-contract having a 15-year validity period that can be renewed. With the cost of diesel fuel approaching $ 1.50 to $ 2/litre in the rural areas, there is no doubt that electricity generation in the isolated mini-grids is very expensive. The electricity tariff is set by AMADER and varies from village to village, depending on the cost of generation. With such high generation cost, it is evident that the tariff is highly subsidised, with the subsidy provided by the Rural Electrification Fund (REF – see below), with resources coming from foreign donors. AMADER has entered into agreements with the World Bank, the Abu Dhabi Fund for Development, etc. to implement 33 diesel/PV hybrids for rural electrification through private sector participation, thus achieving savings on the use of imported diesel fuel, but will provide 80% capital investment subsidy from the REF.

Biomass, in the form of fuelwood and charcoal, represents the single most important renewable energy resource that is utilised as a primary source of household energy for cooking. This causes respiratory and eye problems associated with indoor air pollution in some 80% of households, also leading to high GHG emissions, rapid depletion of the country's forestry resources and environmental degradation. As per the "Plan d'Action National d'Adaptation aux Changements Climatiques", (PANA, July 2007) (National Adaptation Programme of Action for Climate Change), the forest cover in the country decreases by an average of 100,000 ha/year. As such, the dense humid forest that covered 32 million hectares in 1985, covered only 13 million hectares in 2005 and, by 2010, had decreased to 12.5 million hectares (Source: FAO). This reduction in forests also results in reducing the animal habitat, exposing the soil to erosion and seriously affecting water resources.

The Government is cognisant of the fact that the country's heavy reliance on forestry biomass for most of the energy needs of the population, both in the rural and urban/peri-urban areas, is not sustainable. Thus, there is a keen awareness among decision makers of the need to shift towards more sustainable and modern forms of energy, in line with CSCRP 2012 - 2017. In view of the abundance of solar energy, among a basket of renewable energy sources, the Government

proposes to use PV technology, in conjunction with Multi-Functional Platforms (MFPs, see below) to increase provision of electricity services in the rural areas. This does not preclude the use of other available renewable energy sources in the future. MFPs are already used in over 1,000 Malian villages to power a variety of end-use equipment, like grinding mills, vegetable and shea nut presses, welding machines, water pumps, carpentry tools, etc. They also, in a small number of cases, supply electricity, albeit for a limited number of hours in the evening for lighting, and there is already in place a programme for expansion of their use for electricity generation throughout the rural areas in the country. However, there is also a need for small amounts of electricity during the day for such commercial, income-generating activities like ice-making, juice-vending, powering sewing machines, etc. Hence, for such uses, there is no doubt that the use of PV, in a hybrid set-up with an MFP, presents an interesting opportunity for rural pre-electrification (In the Malian context, "skinny" electrification (mainly lighting) utilising MFPs operating a few hours at night is labelled "pre-electrification"). In addition, substituting for the use of imported diesel fuel or extending the number of hours of operation of MFPs operating on locally-produced biofuel from Jatropha, will reduce the pressure on the forest resources and unsustainable land use. Thus, the transformation of the rural energy sector to an economically viable and environmentally friendly system based on a hybrid PV/MFP system requires a comprehensive and multi-faceted approach in the design of appropriate policy and planning frameworks, and incentives to fully integrate this hybrid technology into the country's rural energy mix.

1.1 Stakeholder Analysis and Institutional Framework

The Energy Sector (and, by extension, the Renewable Energy Sub-sector) is under the responsibility of the Ministry of Energy and Water (see Fig. 4 below for institutional set-up) with clearly spelled-out responsibilities as follows:

- Ministère de l'Energie et de l'Eau (MEE - Ministry of Energy and Water) formulates and implements national policy in the fields of Energy and Water. In this capacity and in the field of Energy, it has responsibility for:
  - Development of energy resources and the required infrastructure;
  - Follow-up and supervision of electricity generation, transmission and distribution;
  - Strengthening of the electrical network for national energy supply ;
  - Development of conventional and renewable energy sources; and
  - Development and implementation of regulations in energy exploration and management of energy resources.

  In implementing its policy functions, MEE relies on the support of the National Energy Directorate, National Agency for Renewable Energy, National Agency for the Development of Biofuels and the Agency for the Development of Household Energy and Rural Electrification (all described below) that are entrusted with implementing policy directions and follow-up on project implementation.

- Direction Nationale de l'Energie (DNE - National Energy Directorate) established under Law No. 99-022 of 15 June 1999 is responsible for defining energy policy and for general planning and coordination of stakeholder activities in the energy sector. DNE consists of 4 Divisions, each under the responsibility of a Division Head, viz. Studies, Energy Infrastructure, Energy Management, and Regulation, Documentation and Communication. Under the overall supervision of the DNE Director, the Division Heads prepare technical studies, action programmes within their sphere of competence, coordinate and supervise divisional activities falling under their respective responsibilities.

- Le Centre National de l'Energie Solaire et des Energies Renouvelables (CNESOLER – National Centre for Solar and Renewable Energy), established under Decree No. 90-434/P-RM of 31 October 1990, implements the Government's strategic objective to develop the country's renewable energy potential. To achieve this, CNESOLER is responsible for basic data collection for updating the country's renewable energy potential, to promote research, development, production and commercialisation of renewable energy technologies, to provide technical support to renewable energy programmes implemented in the country and to strengthen the capacity development of local technicians and small and medium enterprises involved in implementing renewable energy options. CNESOLER was in March 2015 renamed AER-Mali (see next para.).

L'Agence Nationale des Energies Renouvelables du Mali (AER-Mali - National Agency for Renewable Energy): CNESOLER was very recently transformed into a National Agency for Renewable Energy, following approval by the National Assembly and issuance of the relevant Decree. This transformed agency is in line with the Government's decision to redefine the terms of reference of certain national institutions in order to make them more responsive to achieving the objectives of SREP (Scaling up for Renewable Energy Programme in low income countries).

AER-Mali is entrusted with the following functions:

- Prepare an inventory and evaluate the country's potential for renewable energy;
- Contribute to the formulation of national strategies for renewable energy;
- Undertake research and development activities in the field of renewable energy;
- Contribute to capacity development of technicians working with renewable energy technologies;
- Undertake testing, quality control and labelling of renewable energy equipment;
- Mobilise resources and implement sustainable financing mechanisms adapted to renewable energy programmes and projects;
- Participate in international technical cooperation activities in the field of renewable energy;
- Contribute to information dissemination and outreach among promoters and users of renewable energy technologies.

- L'Agence Nationale de Développement des Biocarburants (ANADEB - National Agency for the Development of Biofuels): Established in March 2009, its main functions are to ensure uninterrupted supply of biofuels on the market, formulate biofuel standards and monitor the quality of biofuels on sale to consumers, establish the tariff structure of biofuels, support research and development, and ensure capacity development of industrial operators/technicians involved in biofuel production from Jatropha, sugar cane molasses and other energy crops.

- L'Agence Malienne pour le Développement de l'Energie Domestique et de l'Electrification Rurale (AMADER – Agency for the Development of Household Energy and Rural Electrification): Established in May 2003, AMADER is a specialized public administrative institution with financial autonomy and its overall mandate is to promote access to electricity in rural and peri-urban areas. AMADER has the monopoly for the management of any concession with an installed capacity below 250 kW. Within its territory (rural areas), the agency also has the right to manage concessions above 250 kW capacity, although it mostly exercises this right through management contracts with the private sector. This implies that while the private sector can be allowed to generate electricity, all such electricity generated has to be sold to AMADER for distribution and sale.
  AMADER is also entrusted with implementation of the SREP sub-activity dealing with rural electrification through hybrid systems known as SHER (Hybrid Systems for Rural Electrification). As such, it has responsibility to "hybridise" existing AMADER generating facilities operating on diesel fuel.

- Rural Electrification Fund (REF – Box 1): In addition to its above functions, AMADER manages the Rural Electrification Fund, created in 2005 to support rural electrification, fund studies to promote the development of renewable energy, in partnership with CNESOLER/AER and ANADEB, and to co-finance investment. The REF subsidises off-grid tariffs to the tune of 80%. On an average, the REF annually disburses approx. $ 2 million, mainly consisting of grant resources. With resources from foreign sources decreasing, the Government is contemplating replacing the REF by a Solidarity Fund that would be replenished from a levy on the sale of electricity in the cities and on certain goods and services.

- La Commission de Régulation de l'Electricité et de l'Eau (CREE – Electricity and Water Regulatory Commission): Established in March 2000, it is an autonomous and independent body under the Prime Minister's Office and is responsible for setting up electricity and water tariffs and ensuring consumer protection in these 2 sectors.

In addition to the above, there are 2 consultative organs, viz. Commission Nationale des Energies Renouvelables (CNER – National Commission for Renewable Energy; it is presently dormant) that operates under the aegis of the Ministry of Energy and Water and consists of representatives of the public and private sectors, and ASCOMA the Association des Consommateurs du Mali (ASCOMA – Association of Consumers in Mali). Established in January 1991, ASCOMA's objective is to promote and protect the rights of consumers with regard to security of goods and services, information, representation during decision making, safe environment, sustainable consumption, etc. As such, it participates in education and information sharing, consumer responsibility, etc.

Box 1: Rural Electrification Fund

Fund Manager: AMADER

Annual Budget: Approx. $ 2 million

Fund replenished by:

- Government grants;
- Grants from development partners;
- Grants, legacies and loans;
- Fees required to be paid when a request for an operating license is made;
- Any fines imposed on operators ;
- 25% tax on sales figures or renewal requests from those having benefitted from AMADER subsidies;
- Other taxes paid by operators;
- Any financing from the Clean Development Mechanism;
- Annual fees on the number of clients, installed capacity and energy produced by permit holders;
- Investments;
- Contributions from Territorial Communities; and
- Other sources.

The Fund is utilised to:

- Partially fund specific studies for small projects ;
- Provide investment subsidies to approved projects ;
- Strengthen management capabilities of permit holders;
- Serve as equity/counterpart funding for loans contracted from financial partners for rural electrification;
- Promote various activities towards rural electrification, viz. pilot projects, information campaigns, communication capacity development of stakeholders, etc.
- Finance part of AMADER budget upon completion of Household Energy and Access to basic Energy Services in rural areas; and
- Finance client connection costs.

All natural or legal persons, without discrimination of nationality, wishing to implement rural electrification projects or programmes in Mali and having submitted requests for operation and/or subsidies are eligible to receive support from the Rural Electrification Fund, subject to having established a company under Malian Laws.

- L'Agence de l'Environnement et du Développement Durable (AEDD – Agency for Environment and Sustainable Development, under the Ministry of Environment and Sanitation) was established in June 2010 with the objective of promoting sustainable development through efficient management of the environment with a focus on biodiversity preservation, combatting desertification and reducing the negative effects of climate change. As such, it provides coordination during implementation of the National Policy on Environmental Protection and ensures integration of the environmental dimension in all developmental policies, programmes and projects.

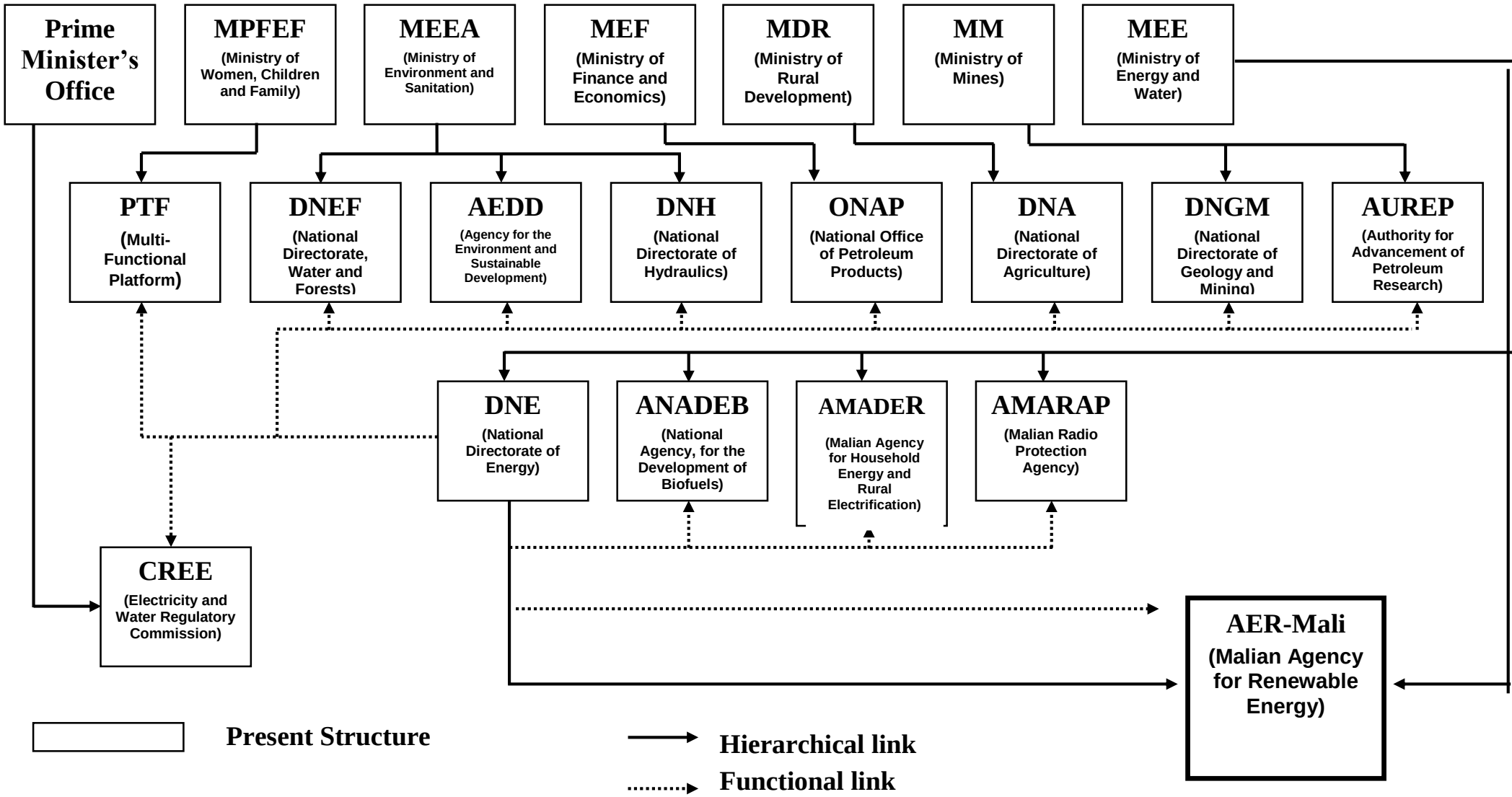

Fig. 4: Institutional Set-up of Energy Sector

1.2 National Strategies and Plans

In October 2003, the President of the Republic addressed a Framework Letter "La Lettre de Cadrage" to the Prime Minister, underscoring the importance of "developing the rural sector" to make it the "engine of economic growth through participation in the take-off of the agro-industrial sector". The Framework Letter underlined that rural development implies strengthening of the infrastructure, including "improvement in energy coverage, its diversification and extension to the rural areas". This was followed by the Government adopting in 2007 a National Energy Policy having the following main priorities:

- Institutional reform of electricity and water sector to entrust the Electricity Company of Mali (EDM-SA), which had responsibility for both the electricity and water, with responsibility for only the electricity sub-sector. This was undertaken with a view to implementing electricity sub-sector reform aimed at eventually separating electricity generation from transmission and distribution.
- Formulation of a national strategy for the development of renewable energy and biofuel, and a rural electrification master plan.
- Establish an institutional and organizational architecture to promote the use of renewable energies, the development of biofuels and the access to energy services in rural areas.
- Develop an energy strategy in order to make energy available for the main urban areas.
- Private sector involvement in the production of decentralized and off-grid energy.
- Establish institutional measures to ensure consistency between energy development and the increasing demand of energy from households and industries (such as mining or processing industries).

In the electricity sub-sector, the objective of the National Energy Policy is, among others, to increase access to electricity services to the rural areas from 12% in 2010 to 55% in 2015. For the renewable energy sub-sector, the objective is to increase its share in electricity generation from 6% in 2010 to 10% in 2015.

At the present time, actions plans for the development of renewable energy and implementation of energy efficiency measures under the Sustainable Energy for All (SE4All) initiative are under formulation. As it is widely known, the objectives of the SE4All initiative are "to ensure universal access to modern energy services", "to double the global rate of improvement in energy efficiency" and to "double the share of renewable energy in the global energy mix". In the case of Mali, a "Gap Analysis" has been completed and the findings are presently being validated.

Under the Copenhagen accord, Mali submitted in 2010 for registration, two NAMAs (Nationally Appropriate Mitigation Action): one in Renewable Energy and Energy Efficiency and the other one in Forestry. With the support of the World Bank, Mali prepared NAMA-1 in January 2010, that focused on renewable energy and energy efficiency with a total abatement potential of 1,285,034 tCO_2 per year through renewable energy production (e.g. with hydro, wind, biomass and solar PV). NAMA-1 identified the need for strengthening existing bodies in order to support a NAMA framework and infrastructure. In addition, Mali conducted a NAMA-2 in the forestry sector that recommended a list of 10 activities comprising afforestation, reforestation, carbon sequestration, etc. with a total abatement potential of 12,000,000 tCO_2/year. For both NAMAs, recommendations were made to strengthen capacity for monitoring, evaluation, provision of technical and financial resources for training and data collection, and to set up an MRV (Measuring, Reporting and Verification) system.

Mali ratified the UNFCCC on December 28, 1994 and the Kyoto Protocol on March 28, 2002. With regard to GHG emissions, the First (Initial) National Communication to UNFCCC prepared in September 2000 indicated that the energy sector was the one producing the main emission of greenhouse gases in the country, i.e. 10 million tCO_2 in 1995, with the total for the country being 28.4 million tCO_2. However, the absorption capacity of the country in the same year was 39.2 million tCO_2, making it a net absorber of greenhouse gas. In the absence of mitigation measures and with the increase in deforestation due to fuelwood consumption for cooking, it is natural that the absorption capacity of the forests will decrease further over the coming years, unless remedial measures are adopted. For the energy sector, activities for implementation were initiated to reduce pressure on forestry resources via a decrease in household wood fuel consumption through the

promotion of locally-developed efficient energy technologies, increased utilisation of renewable energy and through research on agricultural residues and biofuels as alternative energy sources.

The Second National Communication prepared in June 2011 identified the energy sector as the third GHG emitter, after the LULUCF and agriculture sectors. It also witnessed a modest increase in energy sector-related GHG emissions in 2000 to 13.4 million tCO_2, but the remedial measures initiated in 2000 provided positive results in that the country absorption capacity increased to 52.2 million tCO_2. The development of renewable energy technologies for electricity generation, coupled with AMADER and CNESOLER/AER capacity reinforcement, is among the main mitigation measures and priorities for the country. Hence, use of renewable energy in a hybrid combination with diesel or bio-fuel to power MFPs to provide the rural areas with modern and efficient energy services is one of the options in a basket of measures that the Government wants to pursue to reverse the increasing trend in GHG emissions in the country.

PENRAF - Promotion des Energies Nouvelles et Renouvelables pour l'Avancement des Femmes (Promotion of Renewable Energy for the Advancement of Women). This project is implemented by CNESOLER/AER and aims at promoting the concept of "solar villages" by providing rural electrification to 8 selected villages (one in each region). The selected villages will benefit from public lighting, solar cook stoves, battery charging and heating/cooling for food conservation. The beneficiaries in each pilot village can purchase additional individual solar energy equipment through the established Energy Stores.
This project, with an overall budget of $ 3.4 million financed by the Government of Mali and UNDP, commenced implementation in 2012 and is scheduled to complete this year (2015). Within the framework of pilot solar villages, activities were implemented, among others, in Koulikoro (Sirakorola village), Kayes (Ambédi village), Sikasso (Kléla village). In Ségou the village of Kolongo was identified and implementation is on-going. The following renewable energy technologies were installed to demonstrate their technical feasibility and economic viability: PV lighting, solar water heating, solar and wind water pumping, solar cooking, drying and refrigeration, and battery charging. All these technologies were utilized at the request of the beneficiaries who set up a management committee, a fund for maintenance and equipment replacement, recruited personnel to ensure security of the equipment and provide capacity development, etc.
The solar village concept was initiated mainly for demonstration purposes, with no financial model to support any scaling-up.

1.3 Baseline Situation and Problem to be addressed

The Government of Mali realizes that lack of energy access in rural areas is a major detrimental factor for the country's economic development, social and environmental sustainability. To address the problem, the government established a rural electrification agency (AMADER) and a Rural Electrification Fund aimed at providing partial start-up capital for private operators of mini-grids. The project fostered local private sector participation. As of early 2012, prior to the political problems in the country, 43,311 off-grid connections for households and public lighting provided electricity to about 650,000 people. In addition, about 803 public institutions, including 172 schools and 139 health centres, received off-grid access to electricity services. With the installation of multifunctional platforms by local operators in several communities, resulting in over 8,000 connections as of mid-2012, numerous business opportunities were created. The electrification program also fostered the use of renewable energy: more than 7,926 households and 500 institutions were connected to individual solar PV systems.

Mali has a long experience in utilising diesel-powered pumps for irrigation of agricultural fields and household water supply in the rural areas where the electricity grid or isolated mini-grid is absent. It is estimated that several thousand such pumps are operating in the country at the present time. In the early 1990s, within the context of regional UNIDO-IFAD project, a proposal was made to equip these pumps with multi-functional capability to not only pump water, but to also use any associated water-pumping downtime to generate electricity in the evenings and/or provide motive power for grain milling, oil presses, cabinetry, etc. (Fig. 1). Thus was born the Multi-Functional Platform (MFP). This novel approach was tested during 1994 – 1995 in Burkina Faso and Mali and proved to be very popular among the rural population, prompting the Government of Mali and UNDP in 1997 to support and pilot MFPs as a tool for development and the fight against poverty in rural communities.

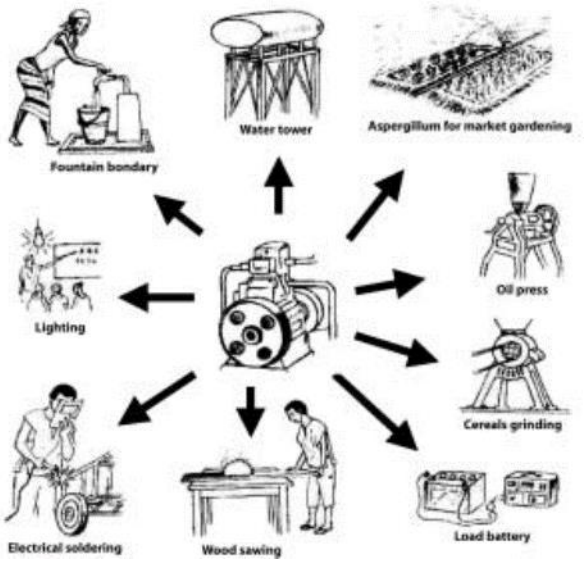

Fig. 5: Potential Uses of a Multifunctional Platform (MFP)
Source: UNDP MFP Review Report, April 2004

Following a participatory evaluation in 1998, a decision was made to implement MFPs at the national level and, with the support of The Gates Foundation, UNDP and UN Goodwill Ambassador Zinedine Zidane, this led to MFPs enabling 450 villages, comprising between 800 and 2000 inhabitants each, in the country to benefit from modern energy services (mainly motive power), albeit for only a few hours a day. This has resulted in reducing poverty in general and, especially, among rural women through the creation of income-generating activities utilizing affordable energy services. After a pilot phase (1995 -1998), followed by further demonstrations (1999 – 2004), a transition phase (2005 – 2007) and, finally, a dissemination phase (2008 – 2013), Mali now possesses a rich experience in MFPs. It is estimated that some 1,145 MFPs have been installed in Mali to date, of which approx. 90% are still in operation. The country is presently formulating a vast programme to equip 5,000 villages with MFPs over the next 5 years and this programme will likely start during the second half of 2015, following approval of the required total budget and resource mobilisation in the amount $ 110 million.

The MFP is one of the principal tools for promoting gender development through (i) access to motive power to decrease the burden on women for physical labour; and (ii) creation of micro-enterprises for income-generating activities on the part of women. In fact, Mali has championed the MFP as the main tool for gender development since the pronouncement made in 2001 by the President of the 3rd Republic, viz "one village, one platform for reducing women labour". This is also in line with the Government's national policy for gender development, as elaborated in the document entitled "Action Plan for a National Gender Policy in Mali, 2011 – 2013". Interestingly, a short time after its introduction, the MFP was labelled as the "silent daughter-in-law" by a Malian woman, in reference to the back-breaking chores (see Fig. 5 above) that daughters-in-law are expected to perform in the rural areas without ever complaining.

In addition to Mali, as one of the two initial countries for MFP piloting (the other one being Burkina Faso), MFPs have now been adopted in Ghana, Guinea and Senegal and are on their way for implementation in other West-African countries like Benin, Chad, Mauritania, Niger, Togo, etc., and was recommended in the ECOWAS White Paper (January 2006) as an option for motive power as an answer to "energy and poverty component". The MFP has also been adopted in Eastern Africa where it is known as the "Energy Service Platform".

MFP Technology for Rural Energy Services

The small size and dispersed locations of villages in Mali make off-grid decentralized diesel-based mechanical and electric energy supply through the utilisation of MFPs as a very viable option; in addition, they can be adapted to the specific needs of every single village. The MFP is a stand-alone power unit that provides decentralised energy services to rural populations. It consists of a low-speed diesel engine (normally 10-hp or 7.5 kW) mounted on a chassis (Photo 1) and can be utilized for a multitude of functions, including water pumping for crop irrigation and household use, but to which can be coupled various other equipment, such as a generator for electricity supply, electric water pumps, grinding mills, battery chargers, oil presses, welding equipment, carpentry tools and other machines used in cabinetry/furniture-making. The engine, normally imported from India, is purposefully designed to accommodate multiple end uses and has an average operational life of 7 years. An MFP can free up time by mechanizing intensive tasks that disproportionately fall on women and girls. Hence, such access to energy services is particularly important for empowering women and increasing girls' opportunities for education.

Given the fact that diesel engines installed in MFPs are robust enough to bear additional charges, AMADER and Women Management Committees (CFGs) have signed partnership agreements under which 110 diesel-fuelled MFPs are already utilised in an equal number of villages for a few hours in the evening to generate electricity mainly for lighting. However, these MFPs can be hybridised with PV, for example, to generate electricity during daylight hours for productive/income-generating activities such as juice and ice making, refrigeration of cold drinks, operation of small machinery, etc., as indicated above. In all these cases and as per present regulations, all low-voltage distributions systems are constructed and owned by AMADER and in view of the short distances over which the power is distributed and the small generation capacities involved, no transmission lines are required.

Photo 1: Multi-Functional Platform (courtesy AER-Mali)

The MFP concept can be summarized as: (i) Assessing demand and selecting a women's group; (ii) Conducting participatory pre-feasibility and feasibility assessments; (iii) Configuring the multifunctional platform to fit the community's needs; (iv) Establishing women's ownership and management (v) Developing women's capacity to operate the multifunctional platform; (vi) Implementing a business approach; (vii) Building the capacity of local technicians (for basic maintenance); and (viii) Monitoring and evaluation. The MFP business model is designed to be managed locally by village communities, especially women groups. A Women's Management Committee (Comité Féminin de Gestion - CFG) is usually put in place whose members are literate for better technical and operational management of MFPs. The CFG

manages day-to-day income generating activities such as payment for grinding and other services. However, as a community-based business model, it requires long preparation times and substantial technical and social capacity building to compensate for the lack of skills and to avoid the potential for social conflicts.

The advantage of this technology is that it is flexible and can easily be adapted to the specific needs of every single village. The initial cost of the MFP, approx. $ 12,000, is met by the Government, with the community's share constituting only 4.5% of that amount. Prior to installation, a 25-person management committee is constituted and provided with management training; however, in some cases, the CFG has decided to entrust management of the MFP to the private sector under a management contract. Given the fact that diesel engines installed in MFPs are robust enough to bear additional charges, AMADER and some CFGs have signed partnership agreements under which the MFP is utilised for a certain period of time daily to generate electricity. This partnership works as follows: the MFP programme builds the MFP and AMADER, as per its exclusive mandate, builds a mini-grid around the MFP to provide electricity to the village. The MFP is still managed by women groups. AMADER provides an agreed lump sum to the women organisation for every hour the diesel generator is operating for electricity generation. Usually, the MFP runs 4 hours during the day for its grinding activities and an additional 4 hours between 7 pm and 11 pm for electricity generation. AMADER is responsible for pricing, billing and recovering from electricity consumers. Today, out of the 1,100 MFPs installed in the country, only some 10% of them are utilised to generate electricity mainly for lighting during a few hours in the evenings.

In view of the ever-increasing costs associated with imported diesel in the rural areas close to $ 1.50 to $ 2/litre, MFPs are fast becoming less economically attractive to operate solely on this fuel. Hence, in order to address this problem, Mali has experimented with Jatropha oil, in replacement of diesel fuel, on several dozen MFPs. The cost of Jatropha oil production in the rural areas is approx. $ 1.10/litre and the residual cake oil is used as fertiliser in agriculture. The Jatropha plant, reportedly originating from India, has traditionally been used in Mali as a hedge around the perimeter of agricultural fields, shielding the crops against grazing animals, as well as serving as a protective barrier against soil erosion from rain and wind. The Jatropha oil, after filtration, can be used directly in the MFP, either alone or in a combination with diesel, without the need for engine adjustment. Unfortunately, in view of the limited production of this biofuel, it is too early for it to position itself as a full substitute to imported diesel, but this situation is likely to change with the massive Jatropha programme presently being implemented by ANADEB.

As of today's date, some 10% of installed MFPs (approx. 110 villages) have resorted to agreements between the CFGs and AMADER in order to extend the modern energy services that can be provided by the MFPs. This MFP-AMADER collaboration enables the provision of electricity services for a few hours in the evening to meet the lighting needs of the communities. In these cases, the consumers pay a monthly fixed charge of 50 US Cents per lighting point per month. This, therefore, opens up the opportunity for hybrid diesel or biofuel/PV (and wind/hydro/biomass, where available) systems to utilise the renewable energy resource to generate small amounts of electricity during the day to allow for productive uses/income-generating activities such as juice and ice making, refrigeration of cold drinks, operation of small electrical machinery, etc. Such a step will take the village towards pre-electrification and serve as a precursor towards full village electrification, with the assistance of AMADER, should the electrical load develop sufficiently in the future. This will also be in line with AMADER's objective to implement decentralised rural electrification through hybrid systems based on diesel generation and renewable energy. While the MFP programme has explored alternative solutions to diesel use, these initiatives remain largely isolated, as only 5% of MFPs combine diesel with either biogas or Jatropha oil.

The lessons learned to date in Mali point towards decentralised and sustainable energy services being made affordable to the rural poor, both women and men, for productive uses/income-generating activities. This "energy conversion – revenue" chain can facilitate the transition to cleaner fuels for MFPs and, at the same time, lead to implementation of energy efficiency measures (e.g. LED lighting) to transform them into an excellent modality for reducing GHG emissions. In addition, the simplicity in the design of MFPs allows for their installation and maintenance by locally-trained technicians and the availability of spare parts do not pose any major problem. Operating on partially (at the present time) locally-available and GHG-neutral Jatropha oil, MFPs can contribute to a large extent to both poverty reduction and GHG emission reduction in Mali and the neighbouring countries. MFPs have freed women from arduous, repetitive and time consuming tasks for better quality of life and ability to pursue income-generating activities and education, in aiding women's

associations to obtain credit, to train women in management (through MFP Women Management Committees) and maintenance and provide them with numeracy, literacy, and entrepreneurial skills.

Table 3 below provides an overview of income and expenditures for a typical month (2013) associated with the operation of an MFP in the village of Coulibalybougou in the District of Sikasso. As it can be noted, the MFP ends up making a profit at the end of the month. Should biofuel have been available to replace diesel, albeit even partially, the savings would have been greater, with a corresponding reduction in GHG emission due to less diesel usage.

Expenditures/month (FCFA)*		Revenue/month (FCFA)	
Diesel	40,750	Milling	34,670
Spare parts	16,000	Shelling	127,650
Salaries	47,915	Battery charging	1,500
Others	20,150	Welding	3,000
Total	124,815	**Total**	166,820

*1 $ = 500 FCFA

Table 3: Average monthly income/expenditures, 2013

Fig. 6 below provides a breakdown in monthly expenditures for the same village of Coulibalybougou in the District of Sikasso; it is seen that salaries and diesel oil constitute the bulk of expenditures.

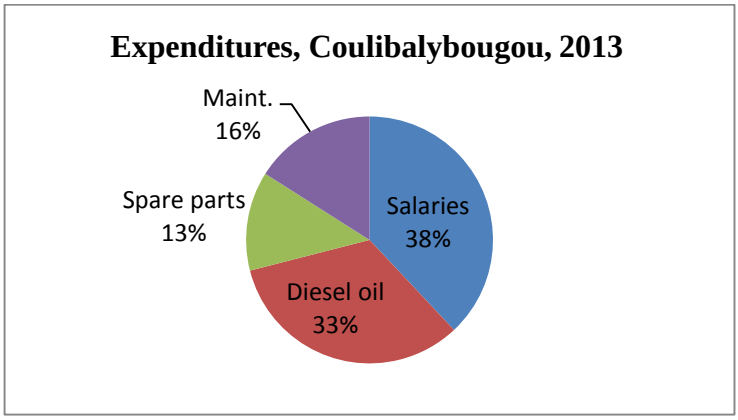

Fig. 6: Overview of costs associated with MFP operation

Fig. 7 below provides information on the time saved by villagers in accomplishing a specific chore (processing of shea nuts) with the assistance of an MFP, with manual processing taking 8.25 hrs and MFP processing being accomplished in half the time. Similar time savings are noted in the accomplishment of different other chores.

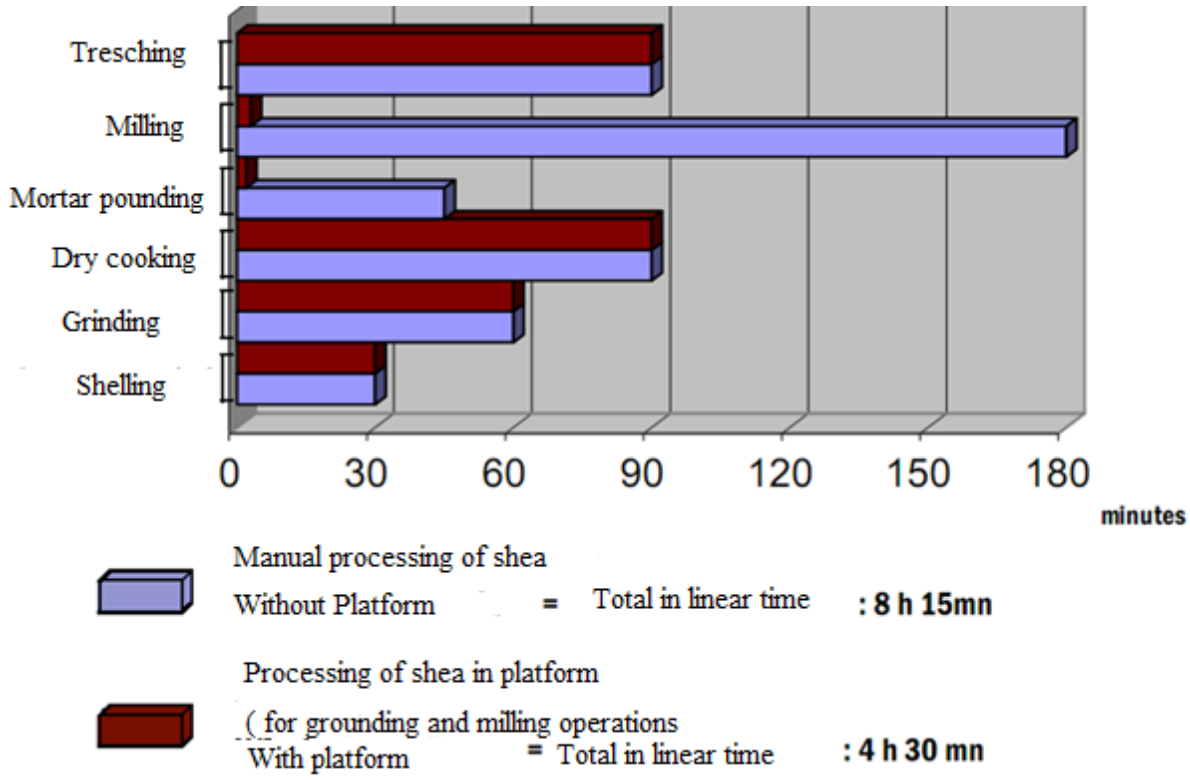

Fig 7: Indicative time saved during processing of shea nuts with and without an MFP

1.4 Barriers to implementing hybrid MFP/PV mini-grids in Mali

There is no experience in Mali with hybrid MFP/PV mini-grids. While some MFPs do generate limited amounts of electricity, utilising diesel/jatropha oil, as the case may be, during the evening hours to meet the needs of the rural population within the MFP "catchment area", there is no electricity generated during the day that could enable its use for productive/income-generating activities such as juice and ice making, refrigeration of cold drinks, operation of small machinery, etc. This is mainly due to the high cost of diesel fuel and the small demand for electricity during the day. However, through hybridising an MFP with PV, for example, it is possible to generate electricity during daylight hours and utilise the existing distribution system (or build a new one if none exists) to provide an electricity service to consumers for commercial uses. Depending on the capacity of the PV to be installed, it may be able to design the PV system for electricity generated during the day to be stored in batteries for use for lighting at night, thus obviating the need to operate the MFP on imported diesel for that purpose.

The present project will provide a novel approach to drive a community-cum-private sector partnership for electricity access for income-generating activities, thus improving the quality of life in the rural areas through the availability of additional monetary resources. The crucial role of the Government will be to create the appropriate environment for this community-cum-private sector-driven modality to successfully move forward.

In line with the foregoing, GEF intervention is needed to remove the legal, regulatory and market barriers which hamper realisation of the Government plans to harness the abundant availability of solar (renewable) energy in a hybrid combination with MFPs for electricity generation in the rural areas. Some of the main barriers are:

- Legal, Regulatory and Institutional Framework: The current legal framework is a barrier to the development of the solar PV market in rural areas in Mali because of the absence of specific provisions/incentives promoting their use.

The rural areas rely on imported diesel fuel to generate electricity in the few places where it is available due to its relative affordability in view of the heavy Government subsidies. According to the IMF, the subsidy towards the energy sector represents almost 1% of the GDP in Mali. Hence, a proper national institutional framework should be put in place to regulate the market, especially in the rural areas where there are no specific provisions enabling IPPs to implement and operate MFP/PV hybrid-based mini-grids. In addition, for the benefits of a hybrid MFP/PV modality for electricity generation in the rural areas to cover the whole country, close coordination between the Ministry of Energy and Water (MEE), which will implement this project, and the Ministry of Women, Children and Family, which will implement the 5,000 MFP programme, should be established.
Institutional and human capacities at the local level are also insufficient to support rural electrification based on hybrid power plants.

- Financial and Economic: There is very limited consumer ability to purchase solar PV systems, especially in the remote rural communities where cash is limited. In Mali, the average per capita GDP is $1,200 per annum ($100 per month) and even the cheapest PV solar home system (locally known as a 75-W kit solaire or solar kit) starts at $ 500, indicating that such systems are simply beyond the reach of the vast majority of households. In addition, the average on-grid electricity generation costs are estimated at 24 US Cents/kWh for the electricity supplier Énergie du Mali SA (EDM-SA), while generation costs in isolated mini-grids are estimated at about 47 US Cents/kWh. This very high unit cost reflects factors specific to rural areas in Mali (high costs of diesel due to transportation and logistical costs, low engine efficiency related to small-size, sub-optimal load factor, high cost of maintenance). In comparison, in urban areas where the electricity tariff is regulated, the unit cost charged to certain consumers can be as low as 15 US Cents/kWh (social tariff). The high generating cost in rural areas leads to difficult return on investments, because of high investment costs and the need for an affordable price of kWh for poor households. A 100% solar PV based system will likely remain unattainable in rural areas in Mali without subsidies. Aside from cost, a 100% PV based system also presents technical challenges and would require a large storage capacity to cover needs during the evening and night hours when there is no sunlight. This will further drive up total costs. However, hybrid systems combining solar PV and fossil fuel, can be viable, if appropriate business models are adopted.
  In addition, discussions held during implementation of the PPG indicated that private sector promoters consider the availability of credit as a major bottleneck to venturing into new business opportunities, including MFP/PV hybrids. On the other hand, lending institutions lack information about PV technology, the transaction costs and contract enforcement issues involved, resulting in their inability to develop a retail product to service the PV sub-sector. Hence, this presents the project with a unique opportunity to support both the lending institutions and the private sector to enter into a win-win situation by having a mechanism that would minimise the lending risks on the part of these institutions and provide confidence to project developers through sharing a small portion of their initial investment costs for PV systems, thus assisting in reducing GHG emission in the country. In this connection, the project will establish a Financial Support Scheme that will consist of an initial $ 800,000 ($ 650,000 from GEF and $ 150,000 from UNDP) that will be available as a Performance-Based Incentive and as an upfront investment grant to undertake a feasibility study and prepare a business plan in order to jumpstart the market for hybrid MFP/PV mini-grids.
  Also, in order to facilitate the uptake of hybrid MFP/PV technology, a set of financial incentives to project developers in terms of, income tax holiday for a specific duration, simplification of foreign exchange regulations, etc. - PV equipment and associated spare parts are already exempted from import duties and local taxes.

- Technical: The combination of power generation sources, using both a fossil fuel (diesel) and a renewable source of energy (PV) for hybrid systems, will necessitate qualified people for their management. AMADER lacks sufficient experience in managing hybrid MFP/PV systems in isolated areas and, therefore, will require additional technical and engineering capacities to ensure optimal system design, installation and maintenance. The low quality and limited availability of skilled and competent technicians in the power sector increase the cost of operation of PV systems due to the need to rely on expensive imported services even for basic repair and maintenance. Thus, effective technical and operational management of the hybrid systems will positively affect the systems' up-time and make the electricity services they generate affordable to consumers.

- Investors' Interest and Risk Perception: There are very few private investors, either national or foreign, in the energy field in the country and most, if not all, energy projects are donor driven, thus largely unsustainable. A large number of private sector investors perceive Mali as being too risky for investment in renewable energy projects. This is motivated by the fact that the WB/IFC Doing Business 2014 data rank Mali at 147 out of 189 economies on protecting investors and 140 out of 189 on enforcing contracts.
  Moreover, information about the potential and the benefits of renewable energy (PV) for rural electrification and development is lacking, leading investors from shying away in investing in expensive systems in the absence of an appropriate billing system to facilitate consumers' ability to pay.

- Sustainable Operation, Maintenance and Management (O&M&M) model: The lack of experience with and demonstration of sustainable operation, maintenance and management of hybrid MFP/PV-based mini grids poses a significant barrier. Before any large-scale replication can take place, such a model has to be designed and tested in order to optimise the substantial transaction costs involved and prove the economic and technical viability of solar PV in rural areas of Mali. The key missing aspects of a sustainable O&M&M model, that need to be put in place are : (i) technical oversight over plant operation and responsibility for repairing faulty equipment such as cracked solar panels and malfunctioning electronic controls; (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 mobilisation, customer relations and conflict resolution procedures (such as in case of illegal connections or theft), mobilisation of consumers/end-users for productive/income-generating activities, etc.

- Promotion/Outreach: In the absence of experience with private sector-implemented MFP/PV hybrid systems, there is evidently a lack of knowledge among a wide range of stakeholders on the benefits that such systems can provide to provide the small amounts of power required for productive uses/income-generating activities in the rural areas. In addition, there is a total lack of information on in-country best practices and lessons learned. Once implementation has started, this situation will be remedied through the compilation and publication of project experience and best practices in electronic form.

A summary of the barriers and the strategy for addressing them are presented in Table 5 below.

Table 5: Summary of barriers and mitigation strategies

Barrier	Present Situation	Strategy for addressing barrier
Legal, Regulatory and Institutional Framework	Absence of proper national institutional framework to act as a catalyst to the market for hybrid MFP/PV mini-grids.	Outcome 1: Formulate an enabling policy, regulatory and institutional framework for hybrid MFP/PV mini-grids.
Financial and Economic	Absence of a financial support to jumpstart projects. Absence of financial incentives to facilitate the uptake of MFP/PV hybrid technology.	Outcome 1: Establish financial support scheme. Outcome 1: Introduce financial incentives for project promoters.
Technical	Lack of skills to design, build, operate and maintain MFP/PV hybrid systems.	Outcome 2: Capacity development of stakeholders.
Investors' Interest and Risk Perception	Absence of investors' interest and high perception of risk.	Outcome 3: Implement business model for financial viability of hybrid MFP/PV systems.
Sustainable Operation,	Lack of experience with sustainable operation,	Outcome 3: Improve technical skills of local operators.

Maintenance and Management	maintenance and management of hybrid MFP/PV-based mini grids.	
Promotion/Outreach	Lack of promotional/outreach activities and absence of project experience/best practices.	Outcome 4: Implement outreach/promotional activities and document project experience.

2. STRATEGY

Project rationale and policy conformity

The project's goal is to reduce GHG emissions by creating a favourable legal, regulatory and market environment and building institutional, administrative and technical capacities to promote rural electrification through hybrid MFP/renewable energy mini-grids.

The objective is to assist the Government of Mali, as outlined in the "2007 National Energy Policy document", to formulate a "national strategy for the development of renewable energy and biofuel, and a rural electrification master plan" and to promote "private sector involvement in the production of decentralized and off-grid energy". As indicated above, 65% of the population is rural, but only 15% of them have access to electricity services. While AMADER tries to annually electrify several villages through diesel generation, it may take a very long time for it to provide electricity services to the 9,000 Malian villages that are not electrified. However, over 1,000 of them have access to MFPs and some 10% of these have coupled them with a generator to provide the villagers with a few hours of electricity service at night. While this does provide these "electrified" village inhabitants with an improved quality of life, they have no access to electricity during the day that could be used for small income-generating activities, in addition to enabling them to experience better living conditions.

In the business as usual scenario, implementation of rural electrification for the majority of the population with reliance solely on budgetary resources and without the participation of the private sector, will take a very long time to materialise. Hence, the project will support the Government of Mali, working with the private sector, to use the approach of integrating renewable energy systems to operate in a hybrid mode with MFPs to generate electricity that will enable the rural population to embark upon income-generating activities utilising electricity services. This is proposed to be achieved through the following:

- Streamlining and simplifying policy, regulatory, legislative and financial instruments for hybrid based mini-grids combined with MFPs;
- Developing capacity of stakeholders for hybrid mini-grid system management combined with MFPs.
- Creating attractive and competitive business terms and conditions for investors, such as providing financial incentives towards project development and implementation, which will give developers long-term stability and provide for sufficient investment return, whatever the case may be; and
- Facilitating implementation of hybrid MFP/renewable energy technology in the country through a pool of trained technicians who would ensure high quality construction, operation and maintenance of the hybrid systems and ancillary equipment.

Institutional Structure

The Ministry of Energy and Water (MEE) is the central body responsible for formulating and implementing the Government's policy in the field of energy. It also entrusted with the responsibility of putting in place policy, plans and programmes that govern rural electrification through either grid extension or isolated mini-grids based on diesel and/or

diesel/renewable energy hybrid systems. To achieve this, it has the support of the agencies that it supervises, viz. National Energy Directorate, National Agency for Renewable Energy, National Agency for the Development of Biofuels and Agency for the Development of Household Energy and Rural Electrification. In this capacity, will be entrusted with implementation of the present project under the UNDP National Implementation Modality (NIM) and, in doing so, it will work very closely with other Government Agencies, private sector and NGOs to ensure that the participation of the full range of stakeholders is secured and effective.

Financial Support Scheme

Investment in renewable energy projects often requires to be supported with financial incentives, at least initially, because such projects are not only typically more investment-intensive in terms of upfront costs, but that they are also, in some cases, considered to be riskier investments due to technology or resource uncertainties. The degree to which cost and risk factors apply varies according to technology and geographical location and project developers expect some form of financial support/risk-sharing to compensate them for taking on additional financial risks due to, as in the case of Mali, the absence of a working business model that can be emulated.

In Mali, the upfront cost of a PV, complete with Balance of System and Inverter, is approx. $ 5,000/kW installed, at present-day prices, and have an average daily output of 6 kWh/kW installed/day. Coupled with the absence of a financially viable tariff, it makes it difficult for private sector investors to venture into this new territory, when generation costs can amount up to around $ 1.60/kWh without the 80% investment subsidy from AMADER, while the tariff charged to consumers is $ 0.47/kWh. (Source: AMADER). However, as per AMADER, this cost is expected to go down with volume when the market for PV installations pick up within the next 7 to 10 years.

As indicated earlier, all private sector generated electricity has to be sold to AMADER for distribution and sale. AMADER also takes responsibility to construct the distribution system, is responsible for pricing, billing and recovery of fees from electricity consumers. However, the private sector may enter into an agreement with AMADER to distribute and sell this electricity to consumers.

To date, this investment subsidy has been covered, as mentioned above, by external donors through a Rural Electrification Fund (REF), but this is clearly not a sustainable solution. As indicated earlier, on an average, the REF annually disburses approx. $ 2 million. With financial resources from foreign sources to continue providing these subsidies decreasing, the Government is contemplating replacing the REF by a Solidarity Fund that would be replenished from a levy on the sale of electricity in the cities and on certain goods and services. Consequently, the signal from the Government is that rural electrification cannot be implemented in the country, at least for the time being, without the continuation of subsidies that allow the tariffs to become affordable to consumers. The high upfront investment cost is a major barrier, as private investors will need to leverage funding. The second major barrier is the setting of an appropriate tariff, allowing financial viability of the system, but also taking into account the capacity to pay in rural areas. The project intends to work on the removal of these barriers.

Consequently, in order to somewhat ease the burden on investors in mobilising resources and on the consumers to make the tariff affordable for them, the project will establish a Financial Support Scheme (FSS) for the following purposes:

(a) To establish a Performance-Based Incentive (PBI) fund (referred to as OBA – Output Based Aid in the PIF) that will be paid directly to the project developer, based on actual energy production of the PV system. This will not only enable the developer to keep the tariff low, but it will also be effective in motivating developers/system owners to focus on proper design, installation, maintenance and performance of their PV systems, since the payment will be based upon the actual energy produced. This will also provide policy makers and regulators with assurance that incentives being provided are being effectively managed and not wasted on a system with poor performance.
For the PBI component of the Financial Support Scheme, the project will allocate a joint GEF-UNDP fund with an initial capital of $ 300,000, viz. $ 250,000 from GEF funds and $ 50,000 from UNDP. This will complement investment support

that is provided by AMADER and assist it in being sensitised that it would be desirable to base its support to off-grid rural electrification also on a performance basis.

(b) To support the preparation of feasibility studies/business plans (FS/BP) and partial investment for PV component of the MFP/PV hybrid system. This will be achieved through the provision of a grant to eligible project developers, in an amount of up to 50% for each of the costs involved for the feasibility study and the investment grant, with a maximum per project allocation not exceeding $ 33,000. It will serve as an incentive to project developers to venture into the business of utilising PV in a hybrid system for electricity generation. While these funds will be ear-marked for the developer, they will be paid directly to the consultants/consultancy group preparing the FS/BP and implementing the works, and disbursements in tranches would be made as per a set of established benchmarks.

For this component of the Financial Support Scheme, the project will allocate a joint GEF-UNDP fund with an initial capital of $ 500,000, viz. $ 400,000 from GEF funds and $ 100,000 from UNDP. This amount will be sufficient to cover support and promotion of the MFP/PV hybrid programme for the 15 villages that will each install one hybrid unit during the 4-year project lifetime.

Box 2 below provides a snapshot of how the FSS will be set up and operate.

Box 2: FSS Snapshot

Financial Support Scheme (FSS)

Purpose: (1) To establish a Performance-Based Incentive (PBI) fund (referred to as OBA – Output Based Aid in the PIF) that will be paid directly to the project developer, based on actual energy production of the PV system. This will not only enable the developer to keep the tariff low, but will also be effective in motivating developers/system owners to focus of proper design, installation, maintenance and performance of their PV systems, since the payment will be based upon the actual energy produced. This will also provide policy makers and regulators with assurance that incentives being provided are being effectively managed and not wasted on a system with poor performance.

For the PBI component of the Financial Support Scheme, the project will allocate a joint GEF-UNDP fund with an initial capital of $ 300,000, viz. $ 250,000 from GEF funds and $ 50,000 from UNDP.

(2) To support the preparation of feasibility studies/business plans (FS/BP) and partial investment for PV component of the MFP/PV hybrid system. This will be achieved through the provision of a grant to eligible project developers, in an amount of up to 50% for each of the costs involved for the feasibility study and the investment grant, with a maximum per project allocation not exceeding $ 33,000. It will serve as an incentive to project developers to venture into the business of utilising PV in a hybrid system for electricity generation. While these funds will be ear-marked for the developer, they will be paid directly to the consultants/consultancy group preparing the FS/BP and implementing the works, and disbursements in tranches would be made as per a set of established benchmarks.

For this component of the Financial Support Scheme, the project will allocate a joint GEF-UNDP fund with an initial capital of $ 500,000, viz. $ 400,000 from GEF funds and $ 100,000 from UNDP. This amount will be sufficient to cover support and promotion of the MFP/PV hybrid programme for the 15 villages that will each install one hybrid unit during the 4-year project lifetime.

Total Initial Capitalisation for (1) and (2) above: $ 800,000 ($ 650,000 from GEF and $ 150,000 from UNDP).

Funds Host/Manager: AMADER

Disbursement: Funds will be disbursed directly to the PV contractor when a contract in due form is in place between him/her and the developer/investor.

Initial duration of FSS: During project lifetime of 4 years.

Disbursements: Initial contribution ratio to be maintained between GEF and UNDP.

The purpose of the FSS in favour of project developers is two-fold: first, it is designed to jump-start the market for MFP/PV hybrid mini-grids through a reduced amount of loan required, resulting in a buy-down of the total interest amount that would have been chargeable to them. As the project builds up experience and transaction costs go down, the percentage of grant/subsidy allocated to developers will decrease until a point is reached when sufficient experience would have been

accumulated that would provide confidence to enable other developers to embark on new projects based solely on their initial capital and a loan. When this point is reached, the subsidy would then be eliminated altogether. The second purpose is to initially minimise any potential risk on the part of lenders in making loans for MFP/PV hybrid mini-grids, by shifting some risk of loss of capital to the investment grant. As they accumulate experience with such loans and repayments, the lenders will have developed sufficient confidence in continuing making additional loans, even in the absence of any subsidy, thus incorporating loans for such systems as a regular retail product in their loan operations.

Prior to allocating this grant, management of the FSS (see below) may request the project developer/private sector to provide evidence that it can bring in some 10 to 15% of equity capital in case its FS/BP qualifies it for consideration for debt financing. Disbursement of this grant will be in accordance with UNDP rules and regulations.

It has been clarified above that the purpose of the investment grant is to jump-start the market and to buy down the initial investment required by the promoter/developer and, consequently, reduce the total interest amount payable. The purpose of the PBI is to make the electricity tariff affordable to rural consumers. In discussions with project developers, this issue will be highlighted and the website will also make it clear that the subsidy is specifically earmarked for reducing transaction costs during the initial years of the project. This, it is hoped, will sensitise project developers to the fact that no more subsidies will be available upon completion of the project nor will they likely be necessary to enable them to achieve a reasonable rate of return on their investment.

There is, of course, a fundamental question of sustainability of resources available under the FSS for this financial support to project developers beyond the projects' lifetime of 4 years. Neither the project nor the Government wants such an important modality for reducing the country's import of fossil fuel through substitution with locally available solar energy not to be sustainable. In fact, the project expects that the experience gained through the operation of the FSS will act as a magnet to other donors (and the Government through the Rural Electrification Fund or the Solidarity Fund) to further capitalise it beyond the initial $ 800,000 ($ 300,000 for the PBI and $ 500,000 for the Investment Grant) with a target of a total of $ 5 million, so that the country can continue benefitting from investment in sustainable hybrid MFP/PV mini-grids. In addition, another possibility would be to recycle some of the savings on the electricity tariffs that the government would have (by not having to pay subsidies any more, or at least at a lower rate) into this Fund to help for its replenishment.

Exit Strategy: For all practical purposes, the FSS is not expected to be a short-lived mechanism; instead, it is meant to be in operation until such time that project promoters/developers gain sufficient confidence that the risk of investing in such systems has been minimised and/or eliminated through the project. When this happens, any remaining FSS funds will be transferred to AMADER to further promote its renewable energy-based rural electrification programme.

Operationalising the FSS

The FSS fund will be hosted/managed by AMADER and will have an Advisory Board consisting of representatives of the Ministry of Energy and Water (MEE) and UNDP. As discussed above, disbursements of the investment grant/subsidy will be made when there is sufficient evidence that it is likely that the developer does qualify for debt financing from a lending institution. For the PBI, funds will be disbursed to the developer on a monthly basis, upon certification by of the number of kWh generated, for which purpose metering at the developer's premises would be required.

Country ownership: country eligibility and country drivenness

Electricity generation through non-hydro renewable energy, which has not been the focus of much attention to date, is one of the important mitigations options that the Government of Mali wishes to pursue for reducing greenhouse gas emissions in the country. In this connection, the Second National Communication prepared in June 2011 identified the energy sector as the third GHG emitter, after the LULUCF and agriculture sectors. It also witnessed a modest increase in energy sector-related GHG emissions in 2000 to 13.4 million tCO_2, but the remedial measures initiated in 2000 provided positive results in that the country absorption capacity increased by approx. 35% to 52.2 million tCO_2. Also, the 2007 "National Energy

Policy" underscores the necessity to, among others, ensure protection of the environment with focus on management of the national energy system through improved development of natural resources and a reduction in the negative impacts of energy on the environment, and energy use in the rural areas for income-generating activities and to reduce the rural exodus towards urban areas. Thus, the project is in line with national priorities and will contribute to meeting the objectives of the Government on global warming and energy development.

Design principles and strategic considerations

The project will promote a market-driven approach to encourage the participation of the private sector to generate electricity in the rural areas through in a hybrid MFP/renewable energy system. In line with GEF requirements, "the emphasis will be upon developing policies and regulatory frameworks that provide limited incremental support to strategically important investments", such as investment in renewable energy electricity generation, allowing the country to move towards energy independence and increased energy security in an environmentally and climate-friendly way.

As the law presently stands, the private sector is allowed to generate electricity, but all such electricity generated has to be sold to AMADER for distribution and sale. In those cases where some MFPs generate electricity for a few hours in the evening, distribution and sale of this electricity is undertaken either by AMADER or its designated contractor and it compensates the MFP owners for equipment and fuel use. The same principle would also apply to the private sector generating electricity from renewable energy in a hybrid configuration with MFPs. However, the private sector may enter into an agreement with AMADER to distribute and sell this electricity to consumers.

Further, the "host country willingness to adopt favourable policies and to follow through on the initiatives" was demonstrated by the Government in the 2003 President's "Lettre de Cadrage" underscoring the importance of "developing the rural sector" and the strengthening of the infrastructure, including "improvement in energy coverage, its diversification and extension to the rural areas". Thus, the project will assist the Government to realise the objectives of the "Lettre de Cadrage" to design and adopt regulations and provide investment support aimed at promoting rural electrification.

Project objective, outcomes and outputs/activities

The objective of the project is to contribute towards the reduction in the growth of GHG emissions through promoting the implementation of small-scale renewable energy/PV-based mini-grids in a hybrid system with MFPs and targets small villages of between 500 and 2,000 inhabitants. It proposes to put in place an enabling environment for the development of these hybrid systems and develop a suitable business model and financial instruments for their viability and replication. It will also showcase a new business model that combines confidence with sustainability and replication. However, it does not venture into large-scale hybrid PV/diesel isolated grids that AMADER plans to implement with the support of the World Bank and other donors to target bigger rural cities. Notwithstanding this, the close partnership that the project will establish with AMADER will assist in benefitting from lessons learned by the latter in implementing rural electrification over the last several years and provide coordination in order to ensure complementarity of activities in the targeted villages for rural electrification through hybrid MFP-PV/renewable energy systems, thus eliminating any possibility of duplication.

There are 11,489 villages in Mali with approx. less than 2,000 inhabitants, with some 9,000 of these villages still being without electrify. This constitutes a huge potential for replication and scaling up utilising a sound business model to be defined and adopted under this project for hybrid mini-grid systems revolving around MFPs. The objectives of the project are proposed to be achieved through the participation of the private sector working hand in hand with MFPs. Thus, this programme will not only benefit rural households, small farmers and commercial institutions, but will also connect the private sector, financial institutions, technical training and local organisations to promote the establishment of distribution channels to develop the hybrid MFP/renewable energy market for the provision of electricity services.

Although the project aims to utilise renewable energy for electricity generation in a hybrid configuration with MFPs, solar PV is the most appropriate source for hybridizing the systems in view of its availability throughout the country and year-

round, rather than wind, hydro or biomass which are very site-specific. The reason for such lower emphasis on "non-solar" renewables is that the wind resource is not accurately known, while the number of sites where a hydro/MFP hybrid could be installed will be limited to having a river in the vicinity (the country is endowed with very few rivers). With regard to biomass, biofuel production from Jatropha and other crops is already a reality in Mali and is being proposed for use on a much larger scale to displace imported diesel.

Project Components

The project consists of four components as outlined below. It is recognised that on-the-job training will be provided by the recruited consultants, both local and international, during the normal course of their support to the relevant project activities and a communication strategy formulated to inform stakeholders on project implementation. This will be in addition to Components 2 and 3 that, respectively, deal with capacity development on technical and financial and technical issues required by key clients and financial institutions. Moreover, the project will seek to achieve gender equality through the empowerment of women to fully participate in all project activities and specifically those related to capacity development under the various components. This will be achieved through working, for example, with NGOs like the Association of Women Engineers for the Promotion of Renewable Energy, National Organisation for Professional Training, National Confederation of Farmer Organisations, Association of Women for Sustainable Development, etc.

The project will also establish a Financial Support Scheme (FSS) to provide tariff relief to consumers through the establishment of a PBI (under Component 1) and to support private investors with an investment grant aimed at jump-starting the market for MFP/PV hybrid mini-grids (under Component 3). Disbursements from the FSS will be made according to a set of criteria to be developed by the Funds Host/Manager (AMADER) during project implementation; as indicated earlier, AMADER, as manager of the Rural Electrification Fund, has extensive experience in disbursement of subsidies in connection with decentralised rural electrification.

Component 1: Policy, regulatory, legislative and financial instruments for hybrid based mini-grids combined with MFPs.

This component will facilitate the development of hybrid MFP/PV mini-grids by increasing the share of renewable energy for electricity generation. At the present time, there are some MFPs that generate diesel-based electricity for a few hours in the evening, but are required by law to sell the electricity in bulk to AMADER for distribution to consumers, although AMADER may itself subcontract this electricity distribution to the private sector. Hence, to bring the private sector into this equation to generate electricity in a hybrid system with the MFP requires a new business model that combines the community-based business model of the MFP with the profit-driven model of the private sector and, consequently, generate a sustainable and win-win partnership that would be beneficial to both the community and the private sector. This could take the form of, for example, the community participating in partially owning the assets (MFP hardware), while entrusting the private sector with its overall daily operation, management and maintenance, in addition to the latter operating and maintaining its own PV system. Such a modality has the potential of reducing operational costs that, eventually, get passed on to consumers/villagers in the form of tariffs that they are charged.

The policy instruments to be developed in this project will be tailored to mini-grids around MFPs, e.g. reduction of upfront investment costs, financially viable tariffs, subsidies, harmonized rural electricity code, concession regimes, licensing rules, PPAs and PPPs for hybrid-based mini-grids around MFPs. Policy instruments will also include an update of the agreement between AMADER and the MFP programme by putting in place a tripartite agreement among AMADER, the MFP programme and investors/developers. The policy instruments will be specific to mini-grids built around MFPs in a hybrid configuration.

Outcome 1: Enabling policy and institutional framework for hybrid MFP/PV mini-grids for rural electrification. The expected outputs under this component are:

- Policy and legislative package for MFP/PV hybrid-based mini-grid rural electrification adopted. Under the proposed Strategic Renewable Energy Programme (SREP) that AMADER will implement with the support of the World Bank

and other donors, the Government will introduce policy and legislation that will enable the private sector to participate in electricity generation through diesel/PV hybrids for the electrification of large cities. However, these do not address the appropriate policy and legislative issues that are necessary to enable the private sector to hybridise MFPs, under a community-cum-private sector business model, with renewable energy for electricity generation to serve populations usually less than 2,000 inhabitants that these MFPs presently serve.

Hence, the project will determine the issues that act as barriers to the private sector playing a role in rural electrification in the country through hybridising MFPs with PV. Following this, the project will develop a policy document outlining the remedial measures that are necessary and propose a legal/regulatory framework that will guide private sector investment in MFP/PV hybrid development. The project will then seek the Government's approval to operationalise this whole set of documents.

- Cornerstone policy instruments defined, adopted and enforced, e.g. strict quality control on imported PV modules, harmonized rural electricity code, licensing rules, PPAs and PPPs for MFP/PV hybrid-based mini-grids. The rural electricity code will specify the variations in voltage and frequency that will be allowed in the electricity supply. In addition, incentives to be provided to project developers developed and operationalised, and these may include any upfront investment subsidies, income tax holiday for a specific duration, simplification of foreign exchange regulations, etc. It is noted that the Government has already eliminated import duties and value-added taxes on renewable energy equipment and spare parts.
- A Performance-Based Incentive scheme to provide tariff relief to consumers, tax breaks, long term concessions to project developers and determination of appropriate tariffs for hybrid-mini grid designed for long term viability. Procedures will be introduced for a transparent and competitive process for the selection of private sector developers to hybridise MFPs under a concessional agreement for a period of 20 years, equivalent to the useful life of the PV modules/panels.

Component 2: Capacity Development for hybrid mini-grid system management combined with MFPs.

This component will address the technical barriers to the implementation of hybrid mini-grids at the community level. The objective is to assist the communities, AMADER and the potential service providers/developers to upgrade their capacity for delivering turnkey solutions for MFP/PV hybrids for electricity generation. Technical assistance will be provided to a number of competitively selected local Small and Medium Enterprises (SMEs) that may be interested in private-sector driven hybrids for the provision of solar equipment and operation/ management of the mini-grids. The SMEs may associate themselves, if they so wish, with international partners to benefit from the latter's exposure to different markets outside Mali.

In addition, the project will provide capacity development to system designers and end-users, develop and publish a manual 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 (women groups, local NGOs and SMEs/productive users) and the private sector will be provided with assistance and advice on the relevant aspects of solar PV operation, such as identification of potential sites, pre-feasibility assessment and business planning. Key stakeholders in the governments, involved civil servants and selected national agencies will also benefit from the capacity development modules.

Outcome 2: Capacity for delivering turnkey solutions and quality Operation, Maintenance & Management (OMM) services for hybrid MFP/PV systems. The expected outputs are:

- Published Guidebook on development of hybrid MFP/PV-based mini grids. This Guidebook will provide a detailed step-by-step approach for implementing hybrid MFP/PV mini-grids and will serve to enhance common understanding and commitment about them. It will also aim at facilitating discussions between MFP community groups and the private sector and serve to demonstrate how MFP/PV mini-grids can be a vehicle to foster economic and social growth, through the achievement of development imperatives, while minimizing negative social, cultural and environmental impacts in the villages. Finally, it will contain all applications forms and will provide information/guidelines on the required documentation for the issuance of construction licenses and permits to potential developers, together with any associated fees.

- Business and technical advisory services to potential MFP/PV- based hybrid mini-grid developers. This "Help Desk" will be housed within MEE and will be staffed with trained personnel to provide quick and targeted responses to requests for assistance and/or guidance to developers on specific issues related to the core aspects of project development, including the preparation of feasibility/business plans and interpretation of tripartite contracts/agreements involving them as developers, the MFP and AMADER. It will also undertake reviews of individual projects prepared by developers for their technical and financial soundness prior to their submission to lending institutions.
- Tailored capacity development programme delivered to relevant stakeholders and hybrid system manufacturers, including on system design, equipment selection, construction and OMM. Training modules will be designed for key beneficiaries (developers, component producers, system designers/installers and service technicians) and capacity development provided to them in support of general business skills development and technical/managerial project implementation. In addition, the project will develop a step-by-step manual for the benefit of system designers, installers and operators to enable them to properly design, build and operate hybrid MFP/PV systems.

Component 3: Showcasing a viable business model for hybrid mini-grids combined with MFPs in 15 villages.

The expected outcome from this component is the improved confidence of communities, developers, the rural electrification agency and potential investors in the technical and economic viability of hybrid-based mini-grid plants combined with MFPs.

The showcase will consist of supporting hybrid diesel/solar PV mini-grids combined with MFPs in 15 villages, by putting in place a suitable business model that allows confidence, sustainability and replication. It is expected that successful piloting in these villages will act as a precursor to implementing similar mini-grid hybridisation around the 5,000 MFPs proposed to be installed under the new Government programme.

Through the implementation of the pilot investment project, the appropriateness of the proposed policy and financing instruments will be demonstrated. The pilots will also be used as a testing ground for developing a domestic technology supply chain. Furthermore, these pilots are expected to generate valuable information on the suitability and practical implementation of the operation, maintenance and 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. equipment owned by association of energy users).

Outcome 3: A functioning business model is demonstrated for the technical and financial viability of hybrid mini-grids combined with MFPs. The expected outputs are:

- Pilot sites for MFP/PV hybrid mini-grids identified, assessed and institutional/investment model defined.
  The pilot sites will be selected on the basis on a set of established criteria and potential developers will be solicited through a competitive bidding process. Determination of the amount of subsidy to a particular project will be made on the basis of an economic and financial analysis, prepared by the developer, which would include the volume of the equity, debt financing and subsidy as inputs to determine the optimum internal rate of return (IRR) that makes the project attractive to the developer. When several developers are competing for a project, the winner will be the one requiring the lowest subsidy.
- Partnerships are established for the design, construction and operation of MFP/PV hybrid mini-grids. These partnerships will aim at improving the technical skills of local operators and may take the form of consortium agreements with equipment producers, suppliers and installers from abroad.
- 15 villages develop and implement sustainable MFP/PV hybrid mini-grids, resulting in cumulative 147 kW of PV installed capacity by project completion.

Village Selection Criteria

The following criteria were developed, in discussions among AER-Mali, AMADER, the MFP project and other stakeholders, during implementation of the PPG, for the selection of the 15 villages where private sector-driven hybrid MFP/PV systems will be installed during the 4-year project time-frame:

In Mali, "skinny" electrification (mainly lighting) utilising MFPs operating a few hours at night is considered as pre-electrification. After having implemented such electrification in several villages and/or community centres, the Government considers it indispensable to hybridise these villages in order to sustain and increase the number of hours/day that electricity services are available, so as to provide the population with opportunities for income-generating activities. What should be the starting point for this?

It is necessary to identify those villages that are more amenable for the development of cost-effective projects, those that can be technically and financially sustainable, while at the same time involving those institutional structures tasked with promoting renewable energy (AER-Mali), rural electrification (AMADER), the Multifunctional Platform project (MFP) and local authorities/stakeholders. The objective pursued is to manage the risks involved and to maximise project viability in order to convince donors and private sector investors alike to embark on this new line of activities and to ensure scaling-up after this pilot phase.

The selection criteria were defined by the national stakeholders on the basis of an AMADER recent rural pre-electrification study in its zones of operation and where there are MFPs with an existing distribution grid already in place for night time electricity supply for a few hours. It also included discussions with the MFP project and the Ministry of Energy. The following are the criteria utilised:

- Availability of a functioning MFP would be an advantage;
- Where an MFP is available, it is managed by a local operator, preferably by the Women's Association;
- Availability of a distribution grid would be an advantage;
- Minimum village population of 500 inhabitants;
- Presence of social infrastructure (school, dispensary, etc.);
- Availability of renewable energy resources in or in proximity to the village;
- Development priorities of local stakeholders.
- Potential for income-generating activities.

Guided by the above criteria and on the basis of discussions with various stakeholders, including those at the individual level, during implementation of the PPG, a short list of 30 villages was established. Then, meetings were held with the local stakeholders in each of the 30 villages, following which these 15 villages (Table 4) were deemed to provide the best conditions to pilot hybrid MFP/PV systems from the point of view of technical feasibility and economic viability. It is understood, however, that these villages constitute a preliminary list that may be subject to change during project implementation, depending on the interest of and confirmation by the stakeholders.

Table 4: Villages selected for installing hybrid MFP/PV systems.

N°	Village / District	Distribution line (km)	No. of inhabitants	No. of households	Electricity Required for:	Daily Electricity Usage (kWh)	PV capacity to be installed (kW)
1	Ouren / Sikasso	1.5	1,036	148	250 LEDs; 2 sewing machines; 1 fridge; 2 chicken incubators; 1 workshop for soldering; 1 water pump; 2 computers; 1 printer; 1 photocopier, 1 jewellery and electronics workshop, 1 battery charging station.	30	7
2	Simidji/ Koulikoro	2	1,883	269	250 LEDs; 2 sewing machines; 2 fridges; 2 chicken incubators; 1 workshop for soldering; 1 water pump; 2 computers; 1 printer; 1 photocopier, 1 jewellery and electronics workshop, 1 battery charging station.	36	8
3	Sido / Koulikoro	2	1,021	145	250 LEDs; 2 sewing machines; 1 fridge; 2 chicken incubators; 1 workshop for soldering; 1 water pump; 2 computers; 1 printer; 1 photocopier, 1 jewellery and electronics workshop, 1 battery charging station.	30	7
4	Tigui / Ségou	1.5	1,360	195	250 LEDs; 2 sewing machines; 2 fridges; 2 chicken incubators; 1 workshop for soldering; 1 water pump; 2 computers; 1 printer; 1 photocopier, 1 rice dehusker; 1 jewellery and electronics workshop, 1 battery charging station.	48	10
5	Dialaya / Kayes	1.5	1,250	180	250 LEDs; 2 sewing machines; 2 fridges; 2 chicken incubators; 1 workshop for soldering; 1 water pump; 2 computers; 1 printer; 1 photocopier, 1 rice dehusker; 1 jewellery and electronics workshop, 1 battery charging station.	30	7
6	Dembéla / Sikasso	1.5	1,650	236	250 LEDs; 2 sewing machines; 2 fridges; 2 chicken incubators; 1 workshop for soldering; 1 water pump; 2 computers; 1 printer; 1 photocopier, 1 rice dehusker; 1 jewellery and electronics workshop, 1 battery charging station.	36	8
7	Fanidiama / Sikasso	2	2,800	400	250 LEDs; 2 sewing machines; 2 fridges; 2 chicken incubators; 1 workshop for soldering; 1 water pump; 2 computers; 1 printer; 1 photocopier, 1 rice dehusker; 1 jewellery and electronics workshop, 1 battery charging station.	54	11
8	Farabougou / Koulikoro	2	1,899	271	250 LEDs; 2 sewing machines; 2 fridges; 2 chicken incubators; 1 workshop for soldering; 1 water pump; 2 computers; 1	30	7

					printer; 1 photocopier, 1 rice dehusker; 1 jewellery and electronics workshop, 1 battery charging station.		
9	Diandioumbéra / Kayes	3	2,533	360	250 LEDs; 2 sewing machines; 2 fridges; 2 chicken incubators; 1 workshop for soldering; 1 water pump; 2 computers; 1 printer; 1 photocopier, 1 rice dehusker; 1 jewellery and electronics workshop, 1 battery charging station; TV at Restaurant.	60	12
10	Yangasso / Ségou	1.5	2,800	400	250 LEDs; 2 sewing machines; 2 fridges; 2 chicken incubators; 1 workshop for soldering; 1 water pump; 2 computers; 1 printer; 1 photocopier, 1 rice dehusker; 1 jewellery and electronics workshop, 1 battery charging station; TV at Restaurant.	60	12
11	Madina / Sikasso	1.5	594	84	250 LEDs; 2 sewing machines; 2 fridges; 2 chicken incubators; 1 workshop for soldering; 1 water pump; 2 computers; 1 printer; 1 photocopier, 1 rice dehusker; 1 jewellery and electronics workshop, 1 battery charging station.	30	7
12	Troun / Kayes	1.5	678	96	250 LEDs; 2 sewing machines; 2 fridges; 2 chicken incubators; 1 workshop for soldering; 1 water pump; 2 computers; 1 printer; 1 photocopier, 1 rice dehusker; 1 jewellery and electronics workshop, 1 battery charging station; TV at Restaurant.	30	7
13	Tella / Sikasso	1.5	1,800	258	250 LEDs; 2 sewing machines; 2 fridges; 2 chicken incubators; 1 workshop for soldering; 1 water pump; 2 computers; 1 printer; 1 photocopier, 1 rice dehusker; 1 jewellery and electronics workshop, 1 battery charging station.	48	10
14	Hamdalaye / Mopti	1.5	2,300	328	250 LEDs; 2 sewing machines; 2 fridges; 2 chicken incubators; 1 workshop for soldering; 1 water pump; 2 computers; 1 printer; 1 photocopier, 1 rice dehusker; 1 jewellery and electronics workshop, 1 battery charging station; TV at Restaurant.	60	12
15	Diou / Sikasso	1.5	2,500	358	250 LEDs; 2 sewing machines; 2 fridges; 2 chicken incubators; 1 workshop for soldering; 1 water pump; 2 computers; 1 printer; 1 photocopier, 1 rice dehusker; 1 jewellery and electronics workshop, 1 battery charging station; TV at Restaurant.	60	12

It is expected that installation of MFP/PV hybrid systems will commence within 12 months after project start and that all 15 hybrids will have been installed by project completion. Of course, it is hoped that the favourable environment that

would have been created by the project would act as a magnet vis-à-vis other project developers to unlock the potential of additional hybrids to be installed in the country, both within the project timeframe and beyond.

Component 4: Outreach programme and dissemination of project activities/results.

Outcome 4: Outreach programme and dissemination of project experience/best practices/lessons learned for replication throughout the country/region. The expected outputs are:

- National Plan to implement outreach/promotional activities targeting both domestic (and international) investors. This will include the preparation of promotional materials, briefing sessions with investors who are already active in the energy/renewable energy field in the country, local businesses that have interest in expanding their activities to include energy for the rural areas and, potentially, organising road shows to attract foreign investors to establish consortia with local businesses to provide the rural areas with modern energy services.
- Capacity development of concerned Ministries/Institutions to monitor and document project experience. On-the-job training will be provided by international/local consultants to the stakeholders on how to monitor, record/document project experience.
- Published materials (including video) and informational meetings with stakeholders on project experience/best practices and lessons learned. These materials, in electronic form, will be widely disseminated throughout the region and among those countries planning to implement similar MFP/Renewable Energy-based hybrids for rural electrification. They will also be posted on the project website.
- Lessons learned and results dissemination workshops.

Key indicators, assumptions and risks

Indicators

Key indicators of the project's success will include:

- 15 hybrid MFP/PV systems installed and providing electricity services to 500 rural households, each consisting of an average of 8 persons.
- Direct CO_2 emissions reduced by 4,216 tons (without replication), under the assumption of a 20-year equipment projected life.
- Indirect post-project CO_2 emissions with replication reduced by 116,462 tons, again assuming a 20-year equipment projected life and 80% GEF causality factor.
- 416 MWh generated by project end and an annual electricity generation of 244 MWh sustained over an expected 20-year projected life of the PV systems installed under the project.
- Capacity developed within AER, AMADER and other relevant Ministries/ Government Departments to promote investment in hybrid MFP/PV technology.
- 75 jobs generated in MFP/PV hybrid technology sector and 500 more jobs in income-generating activities during the project period.
- A total of 3,728 households, each having an average of 8 persons, to benefit from electricity services (almost 30,000 persons).
- Lessons learned documented and distributed to potential investors/stakeholders through publications, public awareness campaigns and project website.

Detailed indicators are provided in the Project Results Framework below.

Assumptions

The assumptions are outlined in the Project Results Framework below.

Risks

The project presents some risks which are discussed in the Table 6 below:

Table 6: Risks, Rating and Impact/Mitigation Approach

Risk	Rating (Probability of occurrence)	Impact/Mitigation Approach
Political risk: Insecurity and political unrest resulting in considerable delays and postponement of project implementation. The country just came out from war and military coup. Any sudden or unexpected change might cause insecurity and cause delays in project implementation. In addition, Mali is located in the very unstable part of the unsecured Sahara.	Moderate	The current political situation in the country is stable. However, the risk of sporadic unrest exist in the North and this may delay implementation of project activities in this part of the country. To mitigate this risk, the project will privilege sites in the Centre and South of the country where the situation is quiet. The project will also build a wide coalition of partners and stakeholders, including civil society, the business community, NGOs and international development agencies, whose interest in MFPs and hybrid mini-grid promotion will likely sustain, even in the event of a regime change.
Policy risk: The success of this project will be determined to a large degree by adoption and effective enforcement of the proposed polices. Lack of policy support may jeopardize the achievement of immediate results and over-all impact.	Moderate	There exists the possibility that the Government may not act on a policy framework that will encourage the private sector to invest in MFP/PV mini-grids. If this risk were to materialise, project implementation will get seriously hampered. However, the donor community will work with the Government to have the right policy in place, in line with the Government's mandate and policy objectives on key national initiatives.
Technology risk: The crack of solar panels is quite common and could result in systems breaking down. Sub-standard quality of locally produced equipment leading to early breakdown of the systems and dwindling consumer confidence in the technology.	Moderate	The project intends to utilise proven, feasible and affordable technologies and replicate solutions that have been successfully introduced in several countries in the region. In this connection, the Government will put in place strict controls on the standards of equipment that can be imported and installed in the country. In addition, the Government will ensure that all installations and maintenance should be undertaken only by licensed and certified technicians as per established electricity codes, building along the way partnerships with equipment producers operating in the country.
Financial risk: Widespread poverty and lack of sustainable source of income resulting in low ability to pay once per month for energy supply services, if appropriate billing system is not in place. There is also a lack of ability to finance projects for SMEs.	Moderate	The project will be mainly implemented in those villages where MFPs are already operational, with some already having existing distribution lines for limited electricity supply from MFPs. In these villages, there is already the capacity and willingness to pay from end-users. On the other hand, the combination of the community business model and private sector business model through partnerships will reduce the financial risk from both sides (community side and private sector side).

Risk	Rating (Probability of occurrence)	Impact/Mitigation Approach
Market risk: In Mali, hybrid systems will have to compete with subsidized and locally available diesel alternatives. Without additional incentives, hybrid plants will likely remain uncompetitive.	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.
Climate risk: Climate change is predicted to cause changes and increase variability of Mali solar and wind patterns. Higher temperatures may cause overheat of solar panels and reduce the efficiency of these panels. And stronger winds may cause destruction and breaking of panels. In addition, MFPs may successfully switch their energy source from diesel to biofuel.	Moderate	In the case of extreme climate change, regular maintenance and inspection will help to cool the solar panels and prevent them from overheating or destruction. Some actions will be adopted in that case, such as attaching a substrate on the glass layer of the solar panels using thermal conductive cement/back sheets, or elevating the solar panels a few inches from the roof to allow cool air to circulate in between. Both of these actions are important to protect them from overheating. Both the number of MFPs and plantation coverage area of Jatropha are increasing, but the Jatropha oil production is not sufficient to feed even a small percentage of the existing MFPs.
Overall Risk Rating	Moderate	

Financial modality

The project is aimed at policy development, capacity building, technical assistance and the provision of financial incentives to catalyse private sector investment in the development and utilisation of MFP/Renewable Energy (PV) technology. A substantial portion of GEF climate change resources will be allocated to a Financial Support Scheme (FSS) that would aim at jumpstarting the market through the provision of financial incentives. The FSS will be initially capitalised in the amount of $ 650,000 from GEF funds and $ 150,000 from UNDP. The FSS will constitute a grant mechanism and the funds will be deposited with and managed by AMADER that, as indicated above, already manages an annual $ 2 million Rural Electrification Fund. The funds themselves will be utilised to cover the initial investment subsidy required by hybrid MFP/PV developers.

The project objective will be attained through technical assistance and facilitating third parties' investment in MFP/Renewable Energy hybrid technology. No loan or revolving-fund mechanisms with GEF funds are considered appropriate, and, therefore, grant-type funding is considered as the most suitable to enable successful delivery of the project outcomes.

Cost-effectiveness

The project is expected to be approved in time to commence activities in early 2016. Under this assumption, activities addressing the policy and regulatory issues for MFP/PV hybrid-based mini-grid rural electrification should be completed within the first year of project activities (Year 1 of project), including regulations and procedures for the private sector to

participate in off-grid rural electrification, model contracts for rural mini-grids and tariffs to be charged to consumers. Under this scenario, it is also assumed that 5 MFP/PV hybrid-based mini-grids will be established during Year 2, 7 in Year 3 and the remaining 3 during Year 4. Hence, by the end of Year 4 (the project final year), all 15 MFP/PV mini-grids should be operational. In addition, the final year (Year 4) of the project will witness a consolidation of the gains and momentum generated during the prior years to expand the rural MFP/PV mini-grid programme. An installation schedule for the MFP/PV mini-grids is provided in Table 8 below.

	Village/District	Installed PV capacity (kW)	Year 2	Year 3	Year 4
1	Ouren/Sikasso	7		✓	
2	Simidji/ Koulikoro	8		✓	
3	Sido/Koulikoro	7	✓		
4	Tigui/Ségou	10		✓	
5	Dialaya /Kayes	7	✓		
6	Dembéla/Sikasso	8	✓		
7	Fanidiama/Sikasso	11		✓	
8	Farabougou/Koulikoro	7			✓
9	Diandioumbéra/Kayes	12	✓		
10	Yangasso/Ségou	12		✓	
11	Madina/Sikasso	7			✓
12	Troun/Kayes	7		✓	
13	Tella/Sikasso	10	✓		
14	Hamdalaye/Mopti	12			✓
15	Diou/Sikasso	12		✓	

Table 8: Installation schedule at-a-glance

As indicated earlier, PV systems installed in Mali generate, on an average, some 6 kWh/kW/day; their availability is assumed at 85%, with the 15% downtime attributed to stoppages for maintenance/repair. As per the above schedule, electricity generation per village over the project duration from Year 2 through Year 4 (no equipment would have been installed during Year 1) will be as follows:

	Village/District	PV capacity installed (kW)	Year 2 (kWh)	Year 3 (kWh)	Year 4 (kWh)	Subsequent Years (kWh/year)
1	Ouren/Sikasso	7	-	6,515	13,030	13,030
2	Simidji/ Koulikoro	8	-	7,446	14,892	14,892
3	Sido/Koulikoro	7	6,515	13,030	13,030	13,030
4	Tigui/Ségou	10	-	9,308	18,615	18,615
5	Dialaya /Kayes	7	6,515	13,030	13,030	13,030

6	Dembéla/Sikasso	8	7,446	14,892	14,892	14,892
7	Fanidiama/Sikasso	11	-	10,238	20,476	20,476
8	Farabougou/Koulikoro	7	-	-	6,515	13,030
9	Diandioumbéra/Kayes	12	11,169	22,238	22,238	22,238
10	Yangasso/Ségou	12	-	11,169	22,238	22,238
11	Madina/Sikasso	7	-	-	6,515	13,030
12	Troun/Kayes	7	-	6,515	13,030	13,030
13	Tella/Sikasso	10	9,308	18,615	18,615	18,615
14	Hamdalaye/Mopti	12	-	-	11,169	22,238
15	Diou/Sikasso	12	-	11,169	22,238	22,238
	Total	147	40,953	144,165	230,523	243,553

Table 9: Electricity generation over project duration

As per Table 9 above, by project completion, some 416 MWh (sum of generation in Years 2, 3 and 4) would have been generated and an annual generation of 244 MWh will be sustained over an expected 20-year projected life of the equipment; this scenario does not make any allocation for additional mini-grids that could be installed during the project timeframe, utilising the momentum generated by the project. All this renewable energy generation, if not implemented, would have otherwise been accomplished through diesel power generation burning imported fuel, with an emission factor of 0.875 tCO_2/MWh (Ref. Second National Communication to UNFCCC). Consequently, during the 4-year project period, 364 tons of CO2 would have been avoided as a direct result of renewable energy-based electricity generation. Furthermore, 214 tons of CO2/year would continue to be avoided annually over the remaining almost 18 years of useful life of the equipment. Thus, the total direct emission reduction, without replication, over a 20-year projected equipment life will be 4,216 tCO_2 (364 tons + 18 x 214 tons = 4,216 tCO_2).

Finally, under the assumption of great interest generated in renewable energy-based mini-grids for rural electrification during project implementation and given the conducive environment for investment that the project would have created, it is highly likely that many more such mini-grids will be built over a post-project period of 10 years, exceeding by several times the number installed during the 4-year project implementation; this is especially so, in view of the expression of interest from donors to promote implementation of scaling-up in case of successful results achieved under this project. Thus, the indirect post-project emission reduction estimates related to only the additional capacity amounting to 5 MW – on the basis of a conservative policy scenario and a GEF causality factor of 80% (top-down approach) -- can be computed to be 116,462 tons of CO_2 avoided, which translates into an abatement cost of $ 10 of GEF funds per tCO_2 reduced. In the case of the bottom-up approach, with a replication factor of 2, the indirect post-project emission avoided would be 8,560 tons of CO_2.

Table 10: Project GHG emission reduction impacts

Time-frame	Direct project without replication (20-year PV projected life).	Indirect post-project (bottom-up)	Indirect post-project (top-down)
Total CO_2 emissions reduced (tons)	4,216	8,560	116,462
Unit abatement cost	$275	$135	$10

Sustainability

From a technical point of view, the viability of tapping renewable energy, either individually or in a hybrid configuration with a non-renewable source, for rural electrification has now been demonstrated in several developing countries, including some located in Africa. By addressing the non-technical barriers that impede the development of MFP/renewable energy hybrids in Mali, the project will assist in creating a sustainable niche through strengthening the policy, institutional, legal, regulatory and operational capabilities of the key national institutions, supporting the development of the technology through a market-driven approach, developing national capabilities and disseminating information. These efforts should ensure the long-term sustainability of MFP/renewable energy technology in the country.

From a financial point of view, the project will support the integration of local manpower and industries into the MFP/renewable energy technology sector. This will be achieved through the provision of focused support to households willing to venture into small income-generating activities utilising electricity, capacity development of technical personnel and local specialised engineering workshops for manufacturing the required ancillary supporting equipment and engineering firms in the design, construction, installation, operation, maintenance and repair of the hybrid systems. With the increase over time in MFP/renewable energy hybrid installations, it is envisaged that such efforts will intensify with opportunities for job creation with additional players entering this field.

Replicability

The Project's potential for replicability within the country is very good in view of the over 1,100 MFPs already installed in the country and the potential installation of another 5,000 MFPs under the proposed programme entitled "National Multifunctional Platforms in Mali":, since the project will adopt a bottom-up approach within the overall policy/investment framework that is envisaged to be developed to promote hybrid MFP/renewable energy installations for rural electrification. Technical assistance for barrier removal and institutional strengthening to be provided under the MSP will facilitate such replicability since it will create the required institutional, policy, and technical conditions to enable the generation of renewed investor interest for the development of additional projects in this field. Moreover, the lessons learned will be of great value to the neighbouring countries sharing a similar resource base, should they decide to tap into their respective MFP country programmes for hybrid MFP/renewable energy-based rural electrification.

Coordination with other GEF-related initiatives

- "*Promotion of the production and use of Jatropha oil as a sustainable biofuel in Mali*": The implementation of this project started 2 years ago, with a total funding of $ 6.7 million (GEF funding: $ 0.95 million) and is aimed at developing and promoting a sustainable model for the production and use of Jatropha oil. The project is contributing to reducing the use of diesel and therefore help to reduce greenhouse gas emissions from the transport and energy production sectors. It aims at significantly contributing to rural development through the shift from diesel to biofuels for multifunctional platforms.
- "*Projet de gestion intégrée des ressources naturelles du Massif du Fouta Djallon*", financed by the African Union, GEF, FAO and UNEP ($ 5 million) is a regional project that covers Gambia, Guinea, Guinea-Bissau, Mali, Mauritania, Niger, Senegal and Sierra Leone. The objectives of the project are (i) to institute sustainable management of natural resources over the medium and long terms to contribute to better conditions of life to the population directly or indirectly dependent on the Highland of Fouta Djallon, aka the Water Tower of West Africa and (ii) to mitigate the cause and incidence of soil degradation on the structural and functional integrity of the Highland. The four-year first phase commenced in July 2009 and, due to delays in project implementation, activities were extended till June 2015. The activities undertaken include the setting up of nurseries for plants, identification of the needs of villages for agricultural tools, seedlings and fertiliser, training on natural resources management, etc. A six-year second phase project is presently in its planning stages.
- "*Strengthening the Resilience of Women Producer Groups and Vulnerable Communities to Climate Change in Mali*": This 5-year project, whose activities will commence soon, has a total funding of $ 22 million (GEF funding: $ 5.5 million) and is aimed at strengthening the means of livelihood of women groups and villagers in 10 vulnerable communes in the districts of Kayes, Koulikoro and Sikasso to increase their resilience to climate

change impacts. This is proposed to be achieved through the improvement of climate change-resistant water management systems for vulnerable groups and investment in innovative approaches and technologies to strengthen local production systems that are resilient to climate change.

During implementation of the proposed project, UNDP will ensure that the various project partners periodically meet to share information on progress in project activities and to avoid any duplication. These meetings may be organised in conjunction with meetings of the Project Board.

Other non-GEF-related Initiatives

- CNESOLER/AER and Malifolkcenter (NGO) has submitted a project for financing to the Abu Dhabi Fund for Development (ADFD) named "Hybrid Systems for Rural Electrification in 30 villages in Mali". The project concept, which consist of installing 4 MW diesel/hybrid solar PV in 30 selected villages, was just pre-approved in January 2014. The ADFD has approved funding of 9 million USD as concessional loan to the project. However, the ADFB is expecting additional criteria to be met before the project implementation. Among them, (i) co-financing (the ADFD covers only 50% of the project cost, the rest needs to be co-financed); (ii) demonstration that the project will be well implemented, under an adequate legal environment; (iii) demonstration of potential replications.

- Programme entitled "National Multifunctional Platforms in Mali": Under this programme, it is proposed to install 5,000 MFPs in an equal number of villages during the period 2014 - 2018. This programme will necessitate a capital outlay of $ 111 million (Govt.: $ 17 million, Beneficiaries: $ 5 million and Donors: $ 89 million) and is under the responsibility of the Ministry of Women, Children and Family. The total funding is not secured yet and Government approval is still awaited. When operational, this programme will provide a clean entry point for the present GEF project to scale up results obtained through utilising a hybrid renewable energy/MFP system for electricity generation.

- The Government of Sweden, with the support of the United States Agency for International Development, will implement during 2015 – 2019 a Natural Resources and Sustainable Development Project that focuses on agriculture. Energy is included in this project as it relates to water pumping for agricultural purposes and for the provision of potable water. Funding in the amount of $ 60 million will be available as Guarantee Fund, with 2 local banks providing an equal amount to complete the Guarantee Fund package of $ 120 million.

- GIZ is implementing a Support Programme for Territorial Communities (PACT - Programme d'Appui aux Collectivités Territoriales) that initially targeted the districts of Koulikoro, Ségou and Mopti, but which has now expanded to cover the whole of Mali. One of the projects implemented under PACT relates to a Communal Electrification Project (ELCOM - Projet d'Electrification Communale) which is jointly financed by the Netherlands Development Cooperation Agency, DGIS. The objective of ELCOM is to pre-electrify 18 rural communities through PV/diesel hybrids and working in collaboration with AMADER. One of the problems faced by ELCOM relates to the quality of imported PV modules which are supposed to last 20 years, but which stop working after only some 6 months, thus causing tremendous frustration among the rural population. This project does not deal with hybridisation of MFPs with PV or any other renewable energy source.

- "Programme Support for Climate Change Adaptation in vulnerable regions of Mopti and Timbuktu": This project is proposed to be funded by the Adaptation Fund to the tune of $ 8.5 million and activities are expected to commence during the second half of 2015. The project will propose an organised response and an anticipated level of governance to the key sectors of the economy in these 2 regions, viz. Agriculture, Livestock, Fisheries, Energy, Health and Infrastructure through (i) enhanced ability of small farmers and pastoralists to cope with increasing climate vulnerability, (ii) systematic integration of the risks associated with climate change, variability into key natural resources, water and agriculture development policies, plans and legislation, and (iii) strengthened institutional capacity to prepare and respond to climate change threats on water and food production systems.

- The World Bank has two major funds aimed at scaling up investment in renewable energy in developing countries including the Strategic Climate Fund (SCF) and the Strategic Renewable Energy Programme (SREP). The Climate Investment Funds (CIF) are a pair of funds established to provide developing countries grant and concessional financing to spur low-emissions and climate-resilient development. Under the Strategic Climate Fund (SCF), one of two CIF trust funds, three targeted programmes have been designed, including the Programme for Scaling up Renewable Energy in Low Income Countries (SREP). The main objective of the SREP is to demonstrate in selected countries, the economic, social and environmental viability of low-carbon development path with a view to increase energy access, by using renewable energy and creating new economic opportunities. The SREP will stimulate economic growth through the scaled-up development of renewable energy solutions. It will act as a catalyst for the transformation of the renewable energy market by obtaining support from the Government of Mali for market creation, private sector implementation, and productive energy use. In addition to the World Bank, SREP will benefit from funding from the African Development Bank and will be implemented by AMADER, with support of CNESOLER/AER and ANADEB.

  The SREP project in Mali "will contribute to increase the number and capacity of large scale RE systems for electricity services (Solar PV and bio-fuel) in existing thermal and new mini-grid systems in rural areas. It will also contribute to: (i) replace diesel fuel usage in rural areas with RE thereby reduce GHG, (ii) increase the number of jobs and productive energy uses in rural areas, with a focus on vulnerable groups (women, youth), (iii) leverage additional resources to complement Government's rural electrification agenda, and (vi) standardize business models for hybrid mini-grids in Mali.

  The strategic directions to be followed under SREP relate to the following 3 axes (Fig. 8):

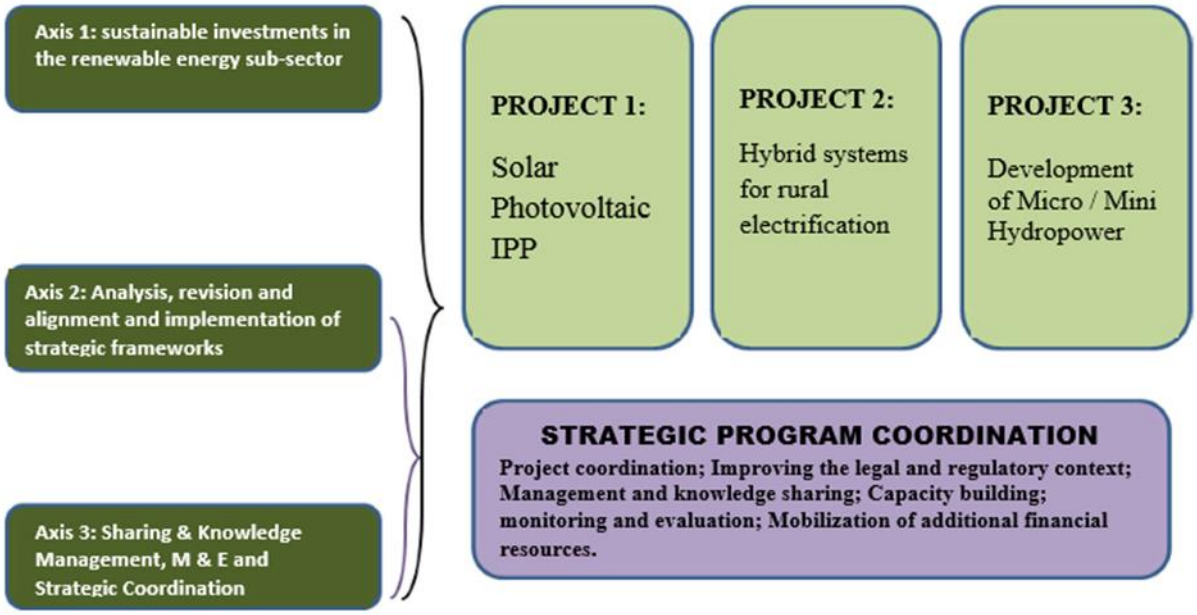

Fig. 8: SREP Strategic Directions

Table 7 below provides an overview of the transformational objectives to be pursued under SREP.

Project	Transformational Aspect	SREP Allocation ($)	Total Cost ($)
Project 1: Central Solar PV through PPP	• Strengthen national capacities and regulatory framework for a wider participation of the private sector in renewable energy. • Create roadmap for IPP participation in the country. • Promote a conducive environment for solar PV development.	12 million	60 million
Project 2: Hybrid Systems for Rural Electrification (SHER)	• Reduce the cost of electricity generation in rural areas through a standardised approach of utilising renewable energy-based hybrid systems. • Expansion of the energy services programmes of local private enterprises, including energy efficiency, off-grid lighting, etc. • Improve economic viability of diesel-based mini-grids in rural areas (reduction of operation costs, environmental impacts). • Promote job creation and productive uses of energy in the rural areas through a combination of investment, technical assistance and capacity development.	15.5 million	57.9 million
Project 3: Project Micro/Mini-Hydro	• Improve access of rural population to modern and affordable energy services. • Positively impact upon the lives of households in rural communities. • Reduce a considerable amount of GHG emissions. • Reduce the health risks associated with the use of candles and kerosene for lighting. • Create employment. • Improve socio-economic development in targeted areas.	10 million	136.5 million

Table 7: SREP Transformational Objectives.

As indicated in Table 7 above, SREP will implement 3 major projects in Mali, viz.: (i) "Solar Photovoltaic Independent Power Producers (IPPs)", (ii) "Rural Electrification Hybrid Systems", and (iii) "Micro and Mini Hydro Power Plants Development (PDM-Hydro)". The overall SREP budget is $ 258 million (the total funding is not yet secured), and the initial implementation period was scheduled from 2012 – 2016. However, due to the May 2012 political crisis in the country, SREP implementation was delayed to until very recently. A group of 3 consultants was recruited in February 2015 and is presently in the process of identifying 50 large villages where hybrid diesel/PV systems will be installed. The expected results from the above activities are:

- Increase in electricity generation from renewable energy by 39 MW.
- Increase in the share of EDM renewable energy-based electricity generation by 10%.
- Increase in the number of rural inhabitants having access to renewable energy services by approx. 350,000.
- Income-generating activities created for approx. 3,000 people, both women and men.
- Establishment of lessons-learned and outreach programme for both in-country and inter-country replication.
- Mobilisation of new and additional resources for renewable energy projects: $ 60 million.

Of particular interest is the second SREP project entitled "Hybrid Rural Electrification Project" which is in line with the present GEF project. The objective of this second project is to support the Government of Mali's efforts to increase access

of isolated low-income populations to basic energy services to help achieve economic growth and poverty reduction targets. SREP will help to address barriers identified in existing energy service delivery schemes in Mali by:

- Introducing further clean and affordable technologies to reduce electricity prices in rural areas;
- Ensuring sustainability of the existing energy delivery initiatives, and
- Securing long term financing to sustain the interest of local private operators in the energy services delivery business.

SREP funds will mainly be used to provide targeted subsidies to buy down upfront capital investment costs of solar PV and biofuel technologies, thereby promoting reduced life cycle costs of electricity generated in rural areas. The project is expected to increase the renewable energy installed capacity in the existing off-grid power stations and gradually expand the construction of renewable energy fuelled mini-grids. In addition to infrastructure investment, the project will support the institutional strengthening of AMADER, develop partnerships with energy sector initiatives at the national, regional, and global levels in order to stimulate renewable energy access for the development of productive energy uses and income generating activities. The successful scaling up of the scope and effectiveness of hybrid mini-grid schemes in isolated off-grid areas in Mali will allow transformative impacts on a countrywide scale and strengthen the effectiveness of Mali renewable and rural energy access agenda.

3. PROJECT RESULTS FRAMEWORK

Project Title: Promoting sustainable electricity generation in Malian rural areas through hybrid technologies.					
UNDAF Outcome(s): The vulnerable population, especially women and young ones, benefit from productive capacities in a (natural) healthy environment favourable to poverty reduction.					
UNDP Country Strategic Plan Environment and Sustainable Development Primary Outcome: Mainstreaming environment and energy.					
Applicable GEF Strategic Objective and Programme: To promote investment in renewable energy technologies.					
Applicable GEF Expected Outcomes: Total "avoided" GHG emissions from electricity generation through MFP/renewable energy hybrid technology.					
Applicable GEF Outcome Indicators: Avoided GHG emissions from electricity generation through MFP/renewable energy hybrid technology (tons CO_2) and \$/t CO_2.					
	Indicator	**Baseline**	**Targets End of Project**	**Sources of Verification**	**Risks and Assumptions**
Objective					
To optimize the electricity generated from Multifunctional Platforms (MFP) for productive energy use by increasing the share of Renewable Energy (RE) and developing an appropriate business model for the sustainability of a hybrid MFP/PV system.	Emission reduction. MWh produced. Number of jobs created.	GHG emissions in the electricity generation sector of the country has increased from 10 million tons in 1995 to 13.4 million tons in 2010. The present contribution of renewable energy, including PV, in the electricity generation mix of the country is negligible. No investment taking place in hybrid MFP/PV mini-grid	PV-based hybrid electricity generation of 244 MWh/year at project completion. Direct reduction of 4,216 tons of CO_2 over the 20-year lifetime of the PV systems. Estimated cumulative indirect GHG emission reduction of 116,462 tons of CO_2 by 2025 on the basis of a conservative policy scenario and a GEF causality factor of 80%. Total of 575 jobs	Project's annual reports, GHG monitoring and verification reports. Project mid-term review and final evaluation reports.	Continued commitment of project partners, including Government agencies and investors/developers.

	Number of beneficiaries.	electricity generation.	created over 4-year project duration. A total of 3,728 households, each having an average of 8 persons, to benefit from electricity services (almost 30,000 persons).		
Component 1: Policy, regulatory, legislative and financial instruments for hybrid based mini-grids combined with MFPs.					
Outcome 1: Enabling policy and institutional framework for hybrid MFP/PV mini-grids for rural electrification.	Existence of adequate policy and regulatory framework.	None available at the present time.	To be completed within 18 months of project initiation.	Published documents. Government decrees/laws.	Commitment of the various Government institutions.
Output 1.1: Policy and legislative package for MFP/PV hybrid-based mini-grid rural electrification adopted.	Existence of adequate policy and regulatory framework.	None available at the present time.	To be completed within 18 months of project initiation.	Published documents.	Commitment of the various Government institutions.
Output 1.2: Cornerstone policy instrument defined, adopted and enforced, e.g. reduction of upfront investment costs and subsidies, harmonized rural electricity code, licensing rules, PPAs and PPPs for MFP/PV hybrid-based mini-grids.	Installed PV capacity.	Not available at the present time.	To be completed within 18 months of project initiation.	Published documents.	Commitment of the various Government institutions and project developers.
Output 1.3: Performance-Based Incentive Scheme, long term concessions and determination of appropriate tariffs for hybrid-mini grid designed and set-up for long term viability.	Existence of enabling regulations.	Not available at the present time.	To be completed within 18 months of project initiation.	Published documents.	Continued investor interest.
Component 2: Capacity Development for hybrid mini-grid system management combined with MFPs.					

Outcome 2: Capacity for delivering turnkey solutions and quality Operation, Maintenance & Management (OMM) services for hybrid MFP/PV systems.	Existence of capacity for installation and maintenance services.	Not available at the present time.	To be completed within 18 months of project initiation and applied by Government thereafter.	Project documentation.	Cooperation of Government entities.
Output 2.1: Published Guidebook on development of hybrid MFP/PV-based mini grids.	Existence of Guidebook.	Not available at the present time.	To be completed within 18 months of project initiation.	Project documentation.	Continued stakeholder interest.
Output 2.2: Business and technical advisory services to potential MFP/PV- based hybrid mini-grid developers.	Existence of Business Unit.	None available at the present time.	To be operationalised within 18 months of project initiation.	Project documentation.	Cooperation of Government entities and private sector.
Output 2.3: Tailored capacity development programme delivered to relevant stakeholders and hybrid system manufacturers, including on system design, equipment selection, construction and OMM.	Existence of training programme.	None available at the present time.	Successful completion of capacity development leads to at least 0.5 MW of projects being appraised by the end of year 1.	Project reports.	Continued stakeholder interest.
Component 3: Showcasing a viable business model for hybrid mini-grids combined with MFPs in 15 villages.					
Outcome 3: A functioning business model is demonstrated for the technical and financial viability of MFP/PV hybrid mini-grids.	Existence of business model.	No such model available now.	Completed within 24 months of project start.	Project reports.	Government entities and private sector will to cooperate.
Output 3.1: Pilot sites for MFP/PV hybrid mini-grids identified and assessed, and institutional/investment model defined.	Selected pilot sites.	Not identified at the present time.	Competitive bidding for concession areas completed within 18 months of project start.	Documents awarding concession areas to private developers available.	Continued interest of private investors.
Output 3.2: Partnerships are established for the construction and operation of MFP/PV hybrid mini-grids.	Signed partnership agreements.	None at the present time.	PPAs for 15 villages involving installation of 147 kW of PV signed by the end of Year 2 of project.	Signed PPAs/ partnership agreements available.	Continued interest of private investors.

Output 3.3: 15 villages develop sustainable MFP/PV hybrid mini-grids, resulting in cumulative 147 kW of PV installed capacity.	MFP/PV hybrid mini-grids in 15 villages.	None at the present time.	All 15 MFP/PV hybrid mini-grids constructed and operational by project end.	Reports confirming operation of all 25 mini-grids available.	Continued interest of private investors.
Component 4: Outreach programme and dissemination of project activities/results.					
Outcome 4: Outreach programme and dissemination of project experience/best practices/lessons learned for replication throughout the country/region.	Existence of outreach programme.	Lack of sufficient information to pursue programme.	Increased awareness among stakeholders in place to promote and develop the market for MFP/PV hybrid mini-grid electricity generation.	Project final report and web site.	Growth of programme will be sustained.
Output 4.1: National Plan to implement outreach/promotional activities targeting both domestic and international investors.	Nation Plan available.	No such plan available.	Completed within 24 months of project initiation. Interest of investors secured to develop another 5 MW of PV/MFP hybrid systems over the next 5 years following project completion.	Project documentation.	Expected expansion of programme.
Output 4.2: Capacity development of concerned Ministries/Institutions to monitor and document project experience.	Compiled data on project experience compiled.	No capacity development programme. None at the present time.	Capacity developed for monitoring of project experience. Completed within 6 months of project end.	Project reports.	Designation of staff by relevant Government Departments/other Institutions.
Output 4.3: Published materials (including video) and informational meetings with stakeholders on project experience/best practices and lessons learned.	Information available on website.	Lack of information on best practices and lessons learned.	Completed within 6 months of project end.	Project documentation and web site.	Continued interest of stakeholders.

Total Budget and Work Plan

Award ID:	00089433	**Project ID(s):**	00095678
Award Title:	GEF PIMS 4903 Hybrid minigrids Mali		
Business Unit:	MLI10		
Project Title:	Promoting sustainable electricity generation in Malian rural areas through hybrid technologies.		
PIMS no.	4903		
Implementing Partner (Executing Entity)	Ministry of Energy and Water (MEE).		

GEF Outcome/ Atlas Activity	Resp. Party / Impl. Agent	Fund ID	Donor Name	ATLAS Budget Code	Atlas Budget Description	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	TOTAL Amount (USD)	Notes
1. Enabling policy and institutional framework for hybrid MFP/PV mini-grids for rural electrification.	MEE	62000	GEF	71200	International Consultants	20,000	20,000	15,000	15,000	70,000	a
		62000	GEF	71300	Local Consultants	10,500	10,000	10,000	10,000	40,500	b
		62000	GEF	71600	Travel	2,000	2,000	2,000	2,000	8,000	c
		62000	GEF	74200	Audio Visual & Print Prod Costs	7,500	7,000	7,000	7,000	28,000	d
		62000	GEF	72100	Contractual Services Companies	0	50,000	100,000	100,000	250,000	e
		62000	GEF	74500	Miscellaneous Expenses	2,744	2,000	2,000	2,000	8,744	f
		62000	GEF	75700	Training, Workshops and Conferences	3,000	0	0	0	3,000	g
					Total Outcome 1 (GEF only)	45,744	91,000	136,000	136,000	408,744	
		04000	UNDP	72100	Contractual Services Companies	0	10,000	20,000	20,000	50,000	e
					Total Outcome 1 (UNDP only)	0	10,000	20,000	20,000	50,000	
					Total Outcome 1 (GEF + UNDP)	**45,744**	**101,000**	**156,000**	**156,000**	**458,744**	
2. Capacity for delivering turnkey solutions and		62000	GEF	71200	International Consultants	25,000	25,000	15,000	15,000	80,000	h

GEF Outcome/ Atlas Activity	Resp. Party / Impl. Agent	Fund ID	Donor Name	ATLAS Budget Code	Atlas Budget Description	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	TOTAL Amount (USD)	Notes
quality Operation, Maintenance & Management (OMM) services for hybrid MFP/PV systems.	MEE	62000	GEF	71300	Local Consultants	7,500	7,500	7,500	7,500	30,000	i
		62000	GEF	71600	Travel	5,000	5,000	5,000	5,000	20,000	j
		62000	GEF	72200	Equipment and Furniture	10,000				10,000	k
		62000	GEF	74500	Miscellaneous Expenses	2,500	2,500	2,500	2,500	10,000	l
					Total Outcome 2	**50,000**	**40,000**	**30,000**	**30,000**	**150,000**	
3. A functioning business model is demonstrated for the technical and financial viability of MFP/PV hybrid mini-grids.	MEE	62000	GEF	71200	International Consultants	10,000	10,000	10,000	10,000	40,000	m
		62000	GEF	71300	Local Consultants	10,000	10,000	10,000	10,000	40,000	n
		62000	GEF	72100	Contractual Services Companies	50,000	100,000	100,000	50,000	300,000	o
		62000	GEF	71600	Travel	5,000	5,000	5,000	5,000	20,000	p
					Total Outcome 3 (GEF only)	75,000	125,000	125,000	75,000	400,000	
		04000	UNDP	72100	Contractual Services Companies	0	20,000	40,000	40,000	100,000	o
					Total Outcome 3 (UNDP only)	0	20,000	40,000	40,000	100,000	
					Total Outcome 3 (GEF + UNDP)	**75,000**	**145,000**	**165,000**	**115,000**	**500,000**	
4. Outreach programme and dissemination of project experience/best practices/lessons learned for replication throughout the country/region.	MEE	62000	GEF	71200	International Consultants	10,000	10,000	10,000	10,000	40,000	q
		62000	GEF	71300	Local Consultants	10,000	10,000	10,000	10,000	40,000	r
		62000	GEF	71600	Travel	2,500	2,500	2,500	2,500	10,000	s
		62000	GEF	74200	Audio Visual & Print Prod Costs	2,000	2,000	2,000	2,000	8,000	t
		62000	GEF	74500	Miscellaneous Expenses	500	500	500	500	2,000	u
					Total Outcome 4	**25,000**	**25,000**	**25,000**	**25,000**	**100,000**	
Project Management	MEE	62000	UNDP	74598	Direct Project Cost	25,000	25,000	25,000	25,000	100,000	v
					Total Project Management (GEF only)	25,000	25,000	25,000	25,000	100,000	
		04000	UNDP	71400	Contractual Services–Individuals	87,500	87,500	87,500	87,500	350,000	y
					Total Project Management (UNDP only)	**87,500**	**87,500**	**87,500**	**87,500**	**350,000**	
					Total Project Management	**112,500**	**112,500**	**112,500**	**112,500**	**450,000**	
	SUB-TOTAL GEF					**220,744**	**306,000**	**341,000**	**291,000**	**1,158,744**	

GEF Outcome/ Atlas Activity	Resp. Party / Impl. Agent	Fund ID	Donor Name	ATLAS Budget Code	Atlas Budget Description	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	TOTAL Amount (USD)	Notes
	SUB-TOTAL UNDP TRAC					**87,500**	**117,500**	**147,500**	**147,500**	**500,000**	
	GRAND TOTAL					**308,244**	**423,500**	**488,500**	**438,500**	**1,658,744**	

	Budget Notes
a	Partial costs of NR CTA and Int. Consultants for policy/legal/regulatory framework.
b	Local consultancy support to NR CTA and Int. Consultants for policy/legal/regulatory framework.
c	Domestic travel to project sites.
d	Publication of policy document, training material, etc.
e	Performance-Based Incentive (PBI) fund.
f	Miscellaneous Expenses
g	Inception workshop.
h	Partial costs of NR CTA and Int. Consultants for turnkey solutions.
i	Local consultancy support to NR CTA and Int. Consultants for turnkey solutions.
j	Domestic travel to project sites.
k	Equipment and software for business facilitation.
l	Computer software for business facilitation.
m	Partial costs of NR CTA and Int. Consultants for village energisation.
n	Local consultants to support village energisation.
o	Equipment and services for village energisation.
p	Domestic travel to project sites.
q	Partial costs of NR CTA and Int. Consultants for outreach programme.
r	Local consultancy to support outreach programme.
s	Domestic travel to project sites.
t	Publications of results obtained, lessons learned, etc.
u	Miscellaneous Expenses
v	Other project costs

	Budget Notes
y	Project management costs

Summary of Funds:

Sources of Cofinancing	Name of Cofinancier	Type of Cofinancing	Amount ($)
National Government	AER (Agency for Renewable Energy)	In-kind	500,000
National Government	AER (Agency for Renewable Energy)	Cash	12,512,393
GEF Agency	UNDP	Cash	500,000
GEF Agency	UNDP (through UNCDF)	Cash	8,500,000
GEF Agency	UNDP	In kind	2,000,000
Total Co-financing			24,012,393

4. MANAGEMENT ARRANGEMENTS

The project will be implemented through the NIM execution modality by AER-Mali under the supervision of the Ministry of Energy and Water (MEE) as the National Implementing Partner (NIP). MEE/AER-Mali will provide office space to the project team as part of its contribution. The Ministry/AER-Mali will assign a senior officer as the National Project Director (NPD) to: (i) coordinate the project activities with activities of other Government entities like the Ministry of Environment, Ministry of Agriculture, Ministry of Women, Children and Family, AMADER, MFP Programme, ANADEB, AEDD, etc. (ii) certify the expenditures in line with approved budgets and work-plans; (iii) facilitate, monitor and report on the procurement of inputs and delivery of outputs; (iv) approve the Terms of Reference for consultants and tender documents for sub-contracted inputs; and (v) report to UNDP on project delivery and impact.

The National Project Director will be assisted by a Programme Management Unit headed by a Project Manager (PM) to be recruited through a competitive process. The PM will be responsible for overall project coordination and implementation, consolidation of work plans and project papers, preparation of quarterly progress reports, reporting to the project supervisory bodies, and supervising the work of the project experts and other project staff. The PM will also closely coordinate project activities with relevant Government and other institutions and hold regular consultations with project stakeholders. In addition, a Project Assistant (PA) will be recruited to support the PM on administrative and financial issues.

The Project Manager will be supported by an international part-time Chief Technical Adviser (CTA), short-term international and national experts/consultants who will support implementation of specific technical assistance components of the project. Contacts with experts and institutions in other countries that have already have experience in implementing MFP/renewable energy hybrids for rural electrification, related policy and financial support measures will also to be established.

A Project Board, chaired by the Ministry of Energy and Water and (MEE) will be established to provide strategic directions and management guidance to project implementation. It will consist of representatives of the relevant ministries and Government Departments/Directorates (Ministry of Environment and Sanitation, Ministry of Finance and Economics, Ministry of Women, Children and Family, Ministry of Rural Development, Ministry of Agriculture, AMADER, MFP Programme, ANADEB, AEDD, etc.) participating in the project, the UNDP Country Office, the National Project Director as well as representatives of the NGO community and women's groups (e.g. Association of Women Engineers for the Promotion of Renewable Energy, Malifolkcenter, SECO-ONG (Mali Council of NGOs), Energia Association, World Vision, CARE – Mali, the proposed Bamako-based AKON Solar Academy, ASCOMA – Association of Consumers in Mali,) etc. Representatives of the private sector may be invited to participate as observers.

Finally, the UNDP CO will provide specific support services for proper project implementation, as required, through its Administrative, Programme and Finance Units and through support from the Addis Ababa Regional Service Centre. Specific support services will include support for annual PIR review (project implementation review), mid-term review and terminal evaluation. An organigramme representing the implementation arrangement is presented in Fig. 9 below.

Project implementation will be governed by the provisions of the present Project Document and Programme and Operations Policy and Procedures (POPP). UNDP Mali will maintain oversight and management of the overall project budget, utilizing a direct payment modality. UNDP Mali's support services will be charged in accordance with the Agreement between the NIP and UNDP for the Provision of Services by UNDP. Governance of the Project will be supported through annual work planning as well as reporting and monitoring the delivery of results and impact on the basis of the results framework. The annual work plans as well as progress reporting will be the responsibility of the project management and will be approved by the NPD in close consultation with UNDP.

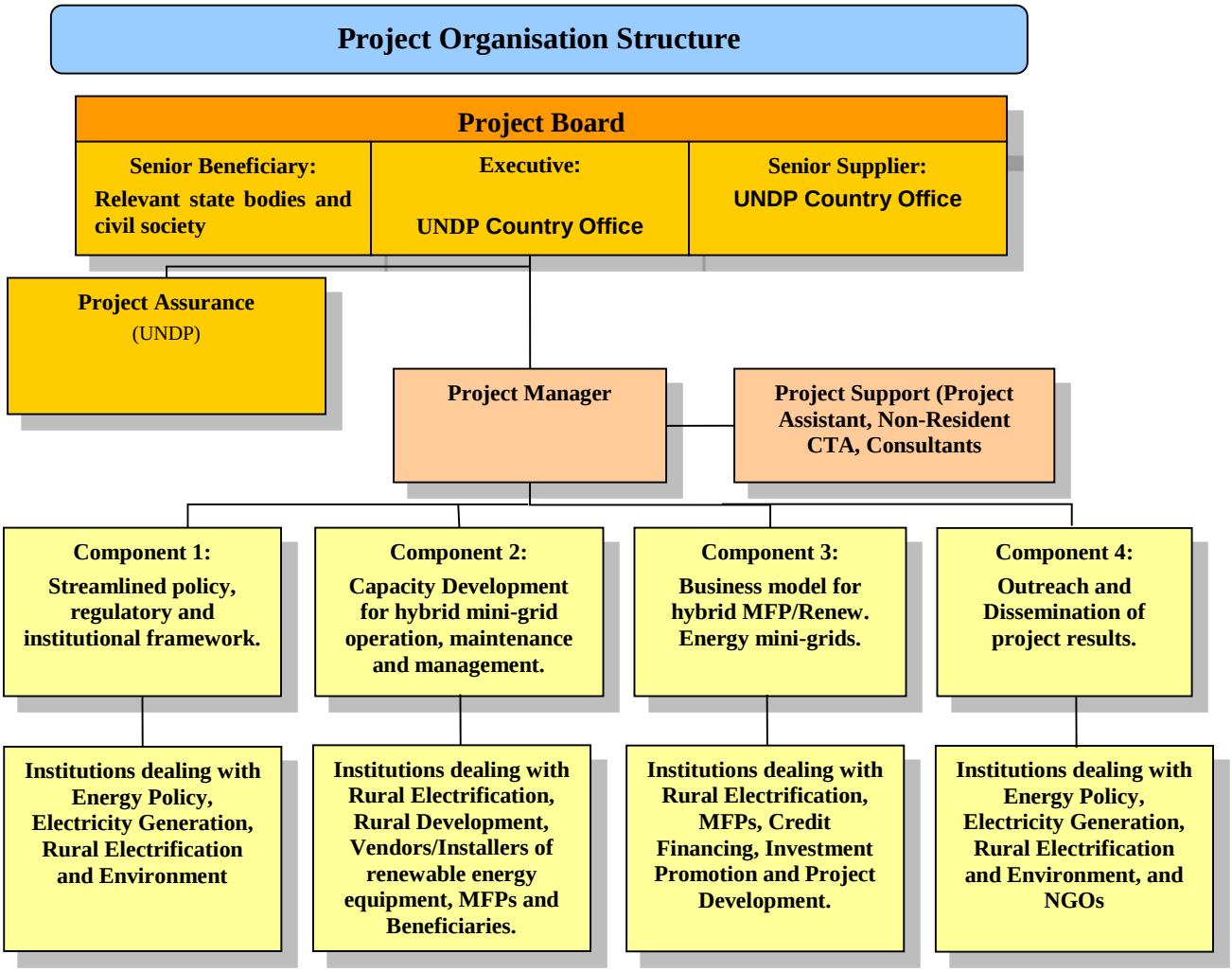

Fig 9: Project Organisation Structure

5. MONITORING AND EVALUATION

UNDP Mali will be responsible for monitoring and evaluation (M&E), including organising 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 RSC 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 Managment 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 RSC 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 RSC 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:

This is a medium-size project and, as such, does not need to be the subject of a mid-term review mid-way through 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 Work Plan and Budget

Type of M&E activity	Responsible Parties	Budget US$ *Excluding project team staff time*	Time frame
Inception Workshop and Report	▪ Project Manager ▪ UNDP CO, UNDP GEF	Indicative cost: 14,000	Within first two months of project start up.
Measurement of Means of Verification of project results.	▪ 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 output and implementation.	▪ 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	▪ Project manager and team ▪ UNDP CO ▪ UNDP RTA ▪ UNDP EEG	None	Annually
Periodic status/ progress reports.	▪ Project manager and team	None	Quarterly
Terminal Evaluation	▪ Project manager and team. ▪ UNDP CO ▪ UNDP RSC ▪ External Consultants (i.e. evaluation team).	Indicative cost : 55,000	At least three months before the end of project implementation.
Audit	▪ UNDP CO ▪ Project manager and team	Indicative cost per year: 7,500 (Total: 30,000)	Yearly
Visits to field sites	▪ UNDP CO ▪ UNDP RSC (as appropriate) ▪ Government representatives	For GEF supported projects, paid from IA fees and operational budget.	Yearly

Type of M&E activity	Responsible Parties	Budget US$ *Excluding project team staff time*	Time frame
TOTAL indicative COST Excluding project team staff time and UNDP staff and travel expenses.		US$ 99,000	

Audit Clause

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

6. LEGAL CONTEXT

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 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.

7. ANNEXES

Annex 1 – Offline risk log
Annex 2 – Terms of Reference
Annex 3 – Letters of Co-financing (Provided in separate file)
Annex 4 – Tracking Tool (Provided in separate file)

ANNEX 1: OFFLINE RISK LOG

#	Description	Date identified	Type	Impact & Probability	Countermeasures/Mgt. response	Owner	Submitted, updated by	Last Update	Status
1.	Political risk: Insecurity and political unrest resulting in considerable delays and postponement of project implementation. The country just came out from war and military coup. Any sudden or unexpected change might cause insecurity and cause delays in project implementation. In addition, Mali is located in the very unstable part of the unsecured Sahara.	During PIF formulation and PPG implementation.	Political	P=4 I=4	The current political situation in the country is stable. However, the risk of sporadic unrest exist in the North and this may delay implementation of project activities in this part of the country. To mitigate this risk, the project will privilege sites in the Centre and South of the country where the situation is quiet. The project will also build a wide coalition of partners and stakeholders, including civil society, the business community, NGOs and international development agencies, whose interest in MFPs and hybrid mini-grid promotion will likely sustain, even in the event of a regime change.	CO to monitor.			
2.	Policy risk: The success of this project will be determined to a large degree by adoption and effective enforcement of the proposed polices. Lack of political support may jeopardize the achievement of immediate results and over-all impact.	During PIF formulation and PPG implementation.	Policy	P = 3 I = 3	There exists the possibility that the Government may not act on a policy framework that will encourage the private sector to invest in MFP/PV mini-grids. If this risk were to materialise, project implementation will get seriously hampered. However, the donor community will work with the Government to have the right policy in place, in line with the Government's mandate and policy objectives on key national initiatives.	CO to monitor.			
3.	Technology risk: The crack of solar panels is quite common and could result in systems breaking down. Sub-standard quality of locally produced equipment leading to early breakdown of the systems	During PIF formulation and PPG implementation.	Technology	P = 3 I = 3	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 connection, the Government will put in place strict controls on the standards of equipment that can be imported and installed in the	CO to monitor.			

#	Description	Date identified	Type	Impact & Probability	Countermeasures/Mgt. response	Owner	Submitted, updated by	Last Update	Status
	and dwindling consumer confidence in the technology.				country. In addition, the Government will ensure that all installations and maintenance should be undertaken only by licensed and certified technicians as per established electricity codes, building along the way partnerships with equipment producers operating in the country.				
4.	Financial risk: Widespread poverty and lack of sustainable source of income resulting in low ability to pay once per month for energy supply services, if appropriate billing system is not in place. There is also a lack of ability to finance projects for SMEs.	During PIF formulation and PPG implementation.	Financial	P = 3 I = 3	The project will be mainly implemented in those villages where MFPs are already operational, with some already having existing distribution lines for limited electricity supply from MFPs. In these villages, there is already the capacity and willingness to pay from end-users. On the other hand, the combination of the community business model and private sector business model through partnerships will reduce the financial risk from both sides (community side and private sector side).	CO to monitor.			
5.	Market risk: In Mali, hybrid systems will have to compete with subsidized and locally available diesel alternatives. Without additional incentives, hybrid plants will likely remain uncompetitive.	During PIF formulation and PPG implementation.	Market/Business	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 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.	CO to monitor.			
6.	Climate risk: Climate change is predicted to cause changes and increase variability of Mali solar and wind patterns.	During PIF formulation and PPG implementation.	Environmental	P = 3 I = 3	In the case of extreme climate change, regular maintenance and inspection will help to cool the solar panels and prevent them from overheating or destruction. Some actions will be adopted in that case,	CO to monitor.			

#	Description	Date identified	Type	Impact & Probability	Countermeasures/Mgt. response	Owner	Submitted, updated by	Last Update	Status
	Higher temperatures may cause overheat of solar panels and reduce the efficiency of these panels. And stronger winds may cause destruction and breaking of panels. In addition, MFPs may successfully switch their energy source from diesel to biofuel.				such as attaching a substrate on the glass layer of the solar panels using thermal conductive cement/back sheets, or elevating the solar panels a few inches from the roof to allow cool air to circulate in between. Both of these actions are important to protect them from overheating. Both the number of MFPs and plantation coverage area of Jatropha are increasing, but the Jatropha oil production is not sufficient to feed even a small percentage of the existing MFPs.				

P = Probability on a scale from 1 (low) to 5 (high). **I** = Impact on a scale from 1 (low) to 5 (high).

ANNEX 2: TERMS OF REFERENCE

1. Project Manager

I. Position Information	
Post title: Office: Organisation: Duration of Employment: Duty station:	Project Manager (Full-time) Project Management Unit (PMU) Ministry of Energy and Water (MEE) One year with possibility of extension Bamako, Mali
II. Duties	
• Lead, manage and coordinate the day-to-day activities of the PMU to be established within MEWF, including administration, accounting, technical expertise, and actual project implementation and reporting; • Lead the development of project design including preparation of consultants' and sub-contractors' terms of reference, identification and selection of national and international sub-contractors/consultants, cost estimation, time scheduling, contracting, and reporting on project activities and budget; • Monitor and follow-up on the status of delivery by consultants, sub-contractors, etc. • Coordinate activities of consultants including contract management, direction and supervision of field operations, logistical support, review of technical outputs/reports, measurement/assessment of project achievements and cost control; • Assist in the design, supervision and outreach activities of the project; • Provide technical support to policy discussions on MFP/renewable energy hybrids for rural electrification in the country; • Act as a liaison/facilitator among the various stakeholders, including the private sector, international and national partners; • Assume responsibility for the quality and timing of project outputs; • Establish and maintain relationships and act as the key focal point with UNDP CO to ensure that all programming, financial and administrative matters related to the project are transparently, expediently and effectively managed, in line with established UNDP Rules and Regulations. • Undertake other management duties that contribute to the effective implementation of the project.	
III. Qualifications and Experience	
Education:	• Master's degree or equivalent in engineering, economics, international development, social sciences, public administration or other relevant field.
Experience:	• Minimum of 5 years of experience in management, preferably in the energy field. • Proven ability to draft, edit and produce written proposals and results-focussed reports. • Proven experience working with Government, civil society, international organizations or donors in combination with the knowledge of economic and financial analysis, institutional, regulatory and policy frameworks. • Good knowledge of and experience GEF 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 countries; • Experience in the use of computers and office software packages (MS Word, Excel, etc.)
Language Requirements:	• Excellent French and English, both written and oral.

2. Project Assistant

I. Position Information	
Post title:	Project Assistant (Full-time)
Office:	Project Management Unit (PMU)
Organisation:	Ministry of Energy and Water (MEE)
Duration of Employment:	One year with possibility of extension
Duty station:	Bamako, Mali

II. Functions

Under the overall supervision of the Project Manager, the Project Assistant will:

- Support the activities of international/national experts, potential investors and sub-contractors;
- Provide administrative support re. typing, filing, arranging visas for international experts/sub-contractors, maintaining project's financial records, etc.;
- Administer project accounting as per UNDP procedures;
- Assist the Project Manager in organising workshops, meetings of the Project Board and other events.
- Assist in procurement of goods and services;
- Draft letters of invitation and agendas for meetings of Project Board/workshops;
- Prepare background information, briefing materials, reports, etc., as required;
- Draft minutes of meetings, monitor/follow-up on actions required.

III. Qualifications and Experience

Education:

- Higher education in economics, management, accounting, finance or other related field.
- Specialized training in finance is desirable

Experience:

- 3 years of relevant administrative, accounting and financial experience at national and/or international level.
- Experience in the usage of computers and office software packages (MS Word, Excel, etc.).
- Previous experience of working for nationally executed programme (s) funded by bilateral/multilateral organisations.
- Practical experience in procurement will be an asset.

Language Requirements:

- Excellent French and English, both written and oral.

3. Chief Technical Adviser (Non-resident)

Post title:	Chief Technical Adviser (Non-Resident)
Office:	Project Management Unit (PMU)
Organisation:	Ministry of Energy and Water (MEE)
Duration of Employment:	12 weeks (over a 4-year period) (15 days per year including 2 missions of 5 days. Contracts for 12 months, renewable based upon performance)
Duty station:	Home Office + Bamako, Mali

II. Duties

Under the overall supervision of the National Project Director, the non-resident Chief 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 the Financial Support Scheme (FSS) 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.

III. Qualifications and Experience

Education:	• Postgraduate degree in energy/renewable energy development.

Experience:	• 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 GEF 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.
Language Requirements:	• Excellent French and English, both oral and written. .

ANNEX 3

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 Mali** (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
David Gressly
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 Energy and Water** 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 **00095678 on "Promoting sustainable electricity generation in Malian rural areas 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: