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United Nations Development Programme

Country: Republic of Congo (Brazzaville)

PROJECT DOCUMENT

**Project Title: Small Hydropower-based Mini-grids for Rural Electrification in
Congo-Brazzaville**

UNDP Strategic Plan Focus Area: Environment and Sustainable Development: Promoting the use of renewable energy and alternative sustainable habitats.

Main streaming environment and energy.

UNDAF Outcome(s): The Government of Congo improves the management of natural resources & associated benefits, the disaster management mechanisms & promotes green economy (UNDAF 2012 – 2017)

Expected CPAP Outcome(s): To promote investment in small and micro hydropower-based mini-grids for rural electrification in Congo-Brazzaville

Executing Entity/Implementing Partner: National Agency for Rural Electrification (ANER)

Implementing Entity/Responsible Partners: United Nations Development Programme (UNDP)

Brief Description

The overarching goal of the project is to contribute to the Congolese Government’s goal of increasing the rate of rural electrification (the 2006 policy goal was to increase it from 5% to 50% by 2015 but that target will not be achieved) and also to avoid emissions of greenhouse gases by improving the enabling environment of small hydro (SHP) mini-grid projects.

To realize this objective, the proposed project will carry out several activities that will deliver specific outputs. The work will be organized in four interrelated components: i) Policy and de-risking instruments for SHP and RE-based mini-grids; ii) Technology supply chain; iii) Deployment of SHP-based mini-grids; iv) Public relations and Promoting investment.

Collectively, these components seek to put in place cornerstone policy instruments at national level, supported by technical, policy-related, educational, and financial measures to raise capacity, reduce risk, and help assure successful implementation.

These activities will contribute to UNDP’s goal of increasing access to sustainable energy services by introducing regulatory and institutions frameworks, promoting technology transfer, and expanding renewable energy practices.

Programme Period:	2015 – 2019	Total resources required	24,644,133 US\$
Atlas Award ID:	XXX	Total allocated resources:	24,644,133 US\$
Project ID:	XXX	• Other:	
PIMS #	4685	○ GEF	1,944,133 US\$
Start date:	July 2015	○ UNDP (Grant)	500,000 US\$
End Date	June 2019	○ Government (Grant)	17,000,000 US\$
Management Arrangements	NIM	○ AfDB Bank (soft loan)	3,000,000 US\$
PAC Meeting Date	TBD	○ Other Grant	1,500,000 US\$
		○ Private sector (equity)	500,000 US\$
		In-kind contributions (ANER)	200,000 US\$

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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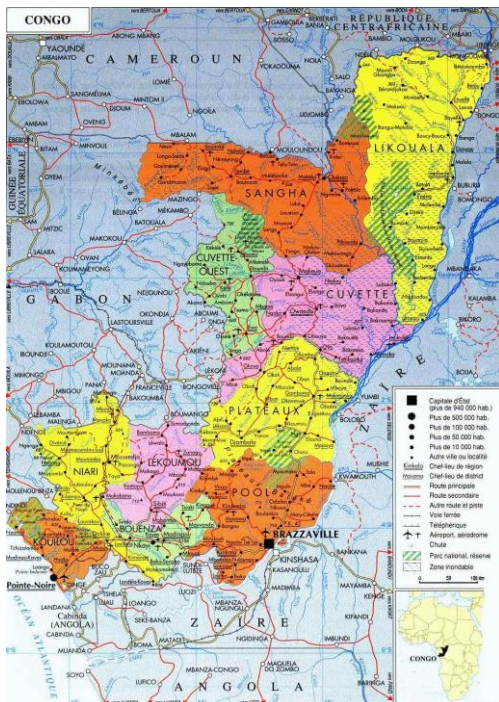
Acronyms

ACRONYM	Meaning
ANER	National Rural Electrification Agency
ARSEL	Power Sector Regulatory Agency
CO2	Carbon dioxide
CPAP	Country Programme Action Plan
EE	Energy Efficiency
EIA	Environmental Impact Assessment
FDSE	National Fund for the Development of the Electricity Sector
GEF	Global Environment Facility
GHG	Greenhouse Gas
GWh	Gigawatthour
M&E	Monitoring and Evaluation
MMEH	Ministry of Mines, Energy and Hydraulic
NGO	Non-Governmental Organization
O&M&M	Operation & Maintenance & Management
PB	Project Board
PFP	RE Project Facilitation Platform
PIR	Project Implementation Review
PMU	Project Management Unit
PPG	Project Preparation Grant
PV	Photovoltaic
RCU	UNDP Regional Coordination Unit
RE	Renewable Energy
RES	Renewable Energy Source(s)
SEN	National Electricity Utility
SHP	Small Hydropower
SNE	Société Nationale d'Électricité
TA	Technical Assistance
UNDP	United Nations Development Programme
UNDP CO	UNDP Country Office
WB	World Bank

1 Situation analysis

1.1 Context and Energy Use in Rural Areas

The Republic of Congo, also known as Congo - Brazzaville, is a country located in Central Africa from both sides of the Equator and covering an area of 342,000 km² and a population of about 4 million inhabitants. The country had an electrification rate of 37.8% in 2012 according to the World Bank's data¹. Meanwhile, most of the rural population does not have access to electricity: in 2010 approximately only 9% according to the Sustainable Energy for All Tracking Report² and the World Bank³ (other sources mention 16% in 2011 according to the African



Development Fund⁴ and 5% in 2012 according to the IEA Africa Outlook Report⁵) has power supply, which is primarily obtained through off-grid small gasoline or diesel genset powered mini-grids. The rest of the populations rely on kerosene, disposable batteries, firewood and agricultural residues to meet basic energy needs. The use of diesel and gasoline-based electric generators in Congo is quite wide-spread; in 2005 their consumption was nearly 163,000 metric tons (t) of fossil fuels per year, meanwhile for households, they predominantly use kerosene for lighting (13,200 t/year)⁶.

Due to high suppressed demand, economic growth and domestic supply of cheap diesel products, the rate of diesel and kerosene use is growing exponentially: according to 2nd National Communication, use of diesel fuel has been steadily increasing between 1994 and 2010 and is projected to nearly double by 2020. The result is high GHG emissions, inefficient use of fossil fuels, and environmental degradation. With a projected steady increase in population volume (2.8% per year) and energy demand (3.4% per year) and in the absence of more climate-friendly sources of power supply, GHG emissions from rural energy use will continue to grow.

¹ Taken from the World Bank Data webpage on October 2014 at: <http://data.worldbank.org/indicator/EG.ELC.ACDS.ZS>

² Sustainable Energy for All, 2013. 2013 Global Tracking Framework Report. Available at: <http://www.se4all.org/tracking-progress/>

³ According to the World Bank's database on the Sustainable Energy for All Indicators, the rural access rate in 2010 was of 9.4%. Consulted on October 2014 and available at: <http://bit.ly/1rrCSVT>

⁴ According to AFD, 2012 the electrification rate in rural areas of Congo is 16%. African Development Fund, 2012. Project Appraisal Report on Rural Electrification for the Republic of Congo. ONEC Department. September 2012. Available at: <http://bit.ly/1sREFYS>

⁵ International Energy Agency, 2014. Africa Energy Outlook : A focus on energy prospects in Sub-Saharan Africa. Full report available at: <http://bit.ly/1Cy6Xsp> and datasets at: <http://www.worldenergyoutlook.org/africa/>

⁶ Ministère du Développement durable, de l'économie forestière et de l'environnement, 2009. Seconde Communication Nationale de la République du Congo à la Convention-cadre des Nations-Unies sur les changements climatiques (UNFCCC). Available at : <http://unfccc.int/resource/docs/natc/connc2.pdf>

1.2 Diesel fuel use for electricity in Congo- Brazzaville

Diesel supply to rural towns which are managed by traditional operators often follow unofficial supply structures, and is strongly affected by the limited road infrastructure to these sites, it is subject to the availability of the supply chain and often do not meet the actual needs. Besides, many of these towns lack the financial resources to pay for the real cost of operation and fuel and many are not operational since their commissioning.

The Government regulates the price of diesel, currently at 475 F CFA/liter (0.9 USD/liter) and is homogeneous throughout the country. This price is of course subsidized, but there is no additional subsidy in fuel prices for the national power utility SNE (Societe Nationale d'Electricite). Due to the difficult context of supply, some rural centers have informal markets of supply, where diesel can reach higher prices over 1000 F CFA/liter (1.9 USD/liter), especially in the North of the country.

The average grid connected electricity generation cost is 0.28 USD/kWh. But the average commercial cost with the national power utility SNE is set at 0.15 USD/kWh. In addition, the real price of electricity in the remote off-grid areas is severaltimes higher than for grid electricity. For instance, all forestry concessions in the North and some in the South have their own electricity generation with diesel gensets for wood processing. The estimated cost of generation is 115 F CFA/kWh (0.22 USD/kWh) for the ones in the South, given the proximity to Pointe Noire. For the ones in the North it can be double, up to 310 F CFA / kWh (0.59 USD / kWh).

In the towns where diesel genset based microgrids are operated by the local authorities, the tariff is agreed with the consumers (although it is not validated by the regulatory agency), which ranges between 3,000 and 5,000 F CFA per month (5.7- 9.5 USD per month). This price is a package and generally includes light (2 bulbs) and an outlet for recharging phones. Such high tariff limits the accessibility to electricity, as many dwellers are unable to afford them.

1.2.1 DIESEL-BASED MICROGRIDS

Only 16 district capitals (out of a total of 86 in the country) are connected to the national grid; the supply of electricity in the remaining 70 is made with thermal off-grid generators. It is expected that within 3 years' time 19 of such towns will be connected to the grid. Besides these off-grid district capitals, there are several rural communities which have microgrids based on diesel generation.

The customers in these rural microgrids are typically households and community services, such as schools, clinics, churches and public lighting. At national level, there is one single operator of the electricity service, which is the power utility Société Nationale d'Électricité (SNE). However, most of the rural microgrids have no structure of management and operation (although some are operated by district authorities). The typical duration of the electricity service is of approximately 5 hours in the nighttime, between 18h and 23h.

The following table illustrates the main characteristics of the electricity supply in the rural towns and communities through diesel generators. Around 40 microgrids have been identified, with a total added thermal capacity of more than 11 MW (per district, the average population is around 2,400 people and the average installed capacity is 300 kW).

Table 1. Main characteristics of electricity supply in rural communities through diesel gensets⁷

Number	Department	District	Town	Population	Number of Households	Generator Installed Capacity (kVA)	Total Installed Capacity (kVA)	Number of Community Services
1	Cuvette	Ngoko	Ngoko	1,623	274	168	168	38
2		Ntokou	Ntokou	1,730	335	50 + 2,5 kWp PV generator	50	15
3		Loukolela	Loukolela	4,889	1 007	150	150	32
4		Makoua	Bokania	537	90	66	66	15
5			Boya	448	75	66	66	15
6			Mohali	n.a.	n.a.	2 x 66	132	38
7		Owando	Manga Boko	n.a.	n.a.	44	44	18
8			Abondzi	620	104	2 x 88	176	34
9			Otsombe	n.a.	n.a.	2 x 88	176	40
10			Ossangou	1,798	300	2 x 88	176	96
11			Kouyou Gandza	354	59	2 x 44	88	22
12			Mboma Ellembe	174	29	2 x 44	88	20
13			Ngouakandi	390	65	2 x 44	88	37
14			Kiambi	524	88	2 x 44	88	32
15		Ondzema	620	104	2 x 44	88	30	
16	Cuvette-Ouest	Mbomo	Mbomo	5,411	902	2 X 500	1,000	150
17		Okoyo	Leketi	779	129	2 X 250	500	85

⁷ This list is not exhaustive of all rural communities, and depicts the main ones identified

Number	Department	District	Town	Population	Number of Households	Generator Installed Capacity (kVA)	Total Installed Capacity (kVA)	Number of Community Services
18		Kellé	Kellé	6254	1 042	2 X 500	1,000	150
19		Okoyo	Okoyo	1,870	312	2 X 500	1,000	150
20		Etoumbi	Etoumbi	12,214	2 036	2 X 500	1,000	150
21		Mbama	Mbama	2,345	391	2 X 500	1,000	100
22		Ewo	Baya	360	60	2 x 66	132	36
23	Plateaux	Ongogni	Ongogni	2,695	449	320 et 150	470	100
24		Allembe	Allembe	626	104	200 et 88	288	80
25		Gamboma	Mbaya	221	37	2 x 66	132	n.a.
26	Pool	Kindamba	Kindamba	6,173	1 028	500	500	n.a.
27		Goma tsé-tsé	Goma tsé-tsé	984	164	500	500	n.a.
28		Louingui	Louingui	1,471	245	500	500	n.a.
29		Vindza	Vindza	773	129	500	500	n.a.
30		Kindamba	Kindamba	6,173	1 028	500	500	n.a.
31	Niari	Divenié	Divenié	3,745	611	1 X 100	100	50
32		Makabana	Makabana	11,238	1 873	1 X 100	100	50
33		Moutamba	Moutamba	2,691	515	2 X 50	100	50
34		Yaya	Yaya	1,074	179	30 et 50	80	50
35		Mayoko	Mayoko	884	190	2 X 50	100	50
36		Banda	Banda	2,053	392	2 X 50	100	50
37		Kimongo	Kimongo	663	223	25 et 50	75	50
38	Kouilou	Kakamoéka	Kakamoéka	1,075	179	40	40	50
39		Mvouti	Bilala	2,977	497	2 x 250	500	152
						Total installed Thermal kVA	11,861	

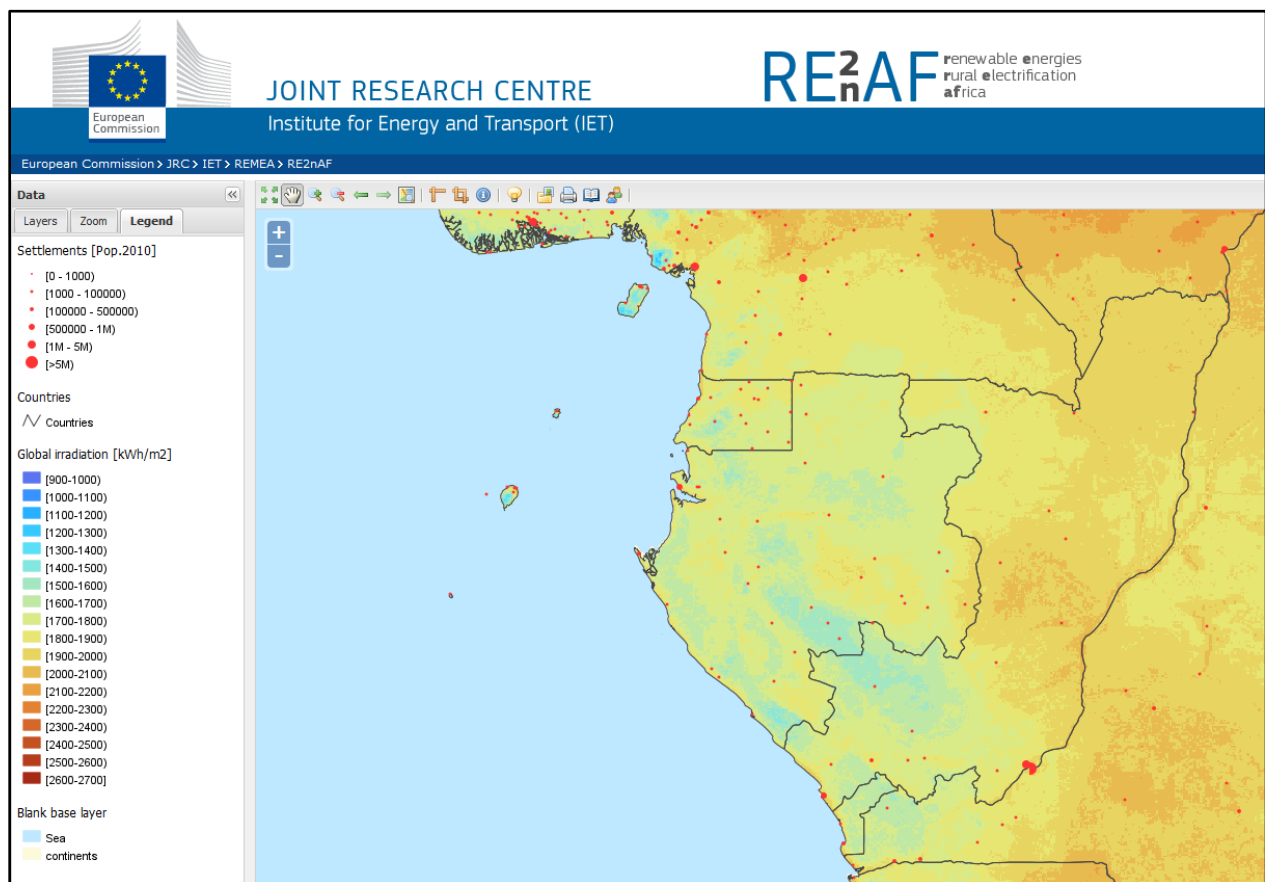
1.3 Renewable Energy Potential and use in Congo-Brazzaville

1.3.1 SOLAR ENERGY

Solar energy on a small scale is used by individuals for lighting, cooking (solar cooking), water heating and some solar home PV systems. Still the use of solar energy in Congo-Brazzaville is not widespread.

With regards to the resource availability the average sunshine in Congo-Brazzaville has a potential of 4.5-5 kWh/m²/day.

Figure 1. Global irradiation IN Congo Brazzaville (yearly kWh/m²/year)^{8,9}



⁸ Šúri M., Huld T.A., Dunlop E.D. Ossenbrink H.A., 2007. Potential of solar electricity generation in the European Union member states and candidate countries. *Solar Energy*, 81, 1295–1305, <http://re.jrc.ec.europa.eu/pvgis/>.

⁹ Huld T., Müller R., Gambardella A., 2012. A new solar radiation database for estimating PV performance in Europe and Africa. *Solar Energy*, 86, 1803-1815.

The favorable conditions of solar irradiation together with recent cost reductions of photovoltaic technologies can provide a very significant contribution to the rural population's access to basic energy services.

1.3.2 WIND ENERGY

There is no Wind Resource Atlas in the country and the very few assessments of wind resource, made at low heights of 10-12 m, have provided low windspeeds (around 2 m/s) with high variation throughout the year. These values do not justify commercial exploitation of the wind energy for electricity generation. It would be thus advisable to launch a country-wide wind resource assessment, focused on the coastal region and at higher heights (30 and 40 m) in order to develop a proper Wind Atlas of the country.

1.3.3 BIOMASS ENERGY

Congo is largely covered by forest (60% of the country) representing 10% of all tropical rainforests in the world. The land covered by forest is divided into Mayombe (2 million ha), Challu (3 million ha) and Northern Congo (15 million ha).

Biomass is currently used, as an energy source, mainly by households for cooking and it represents around 80% of the energy demand in the country, often in the form of charcoal, which is produced at low efficiencies (10-15%) and supplied through informal channels.

A thorough assessment of energy use, namely of use of biomass, would be advisable in order to have more accurate information to work with.

1.3.4 HYDROPOWER

The Republic of Congo has a dense hydrographic system that is organized around two major river basins: the Congo River basin, which covers about 72% of the total area of the country and the Kouilou-Niari, covering about 16%. Other two less important coastal basins are Loémé and Nyanga. Groundwater is also abundant. The potential of hydropower has been estimated to be around 14,000 MW¹⁰.

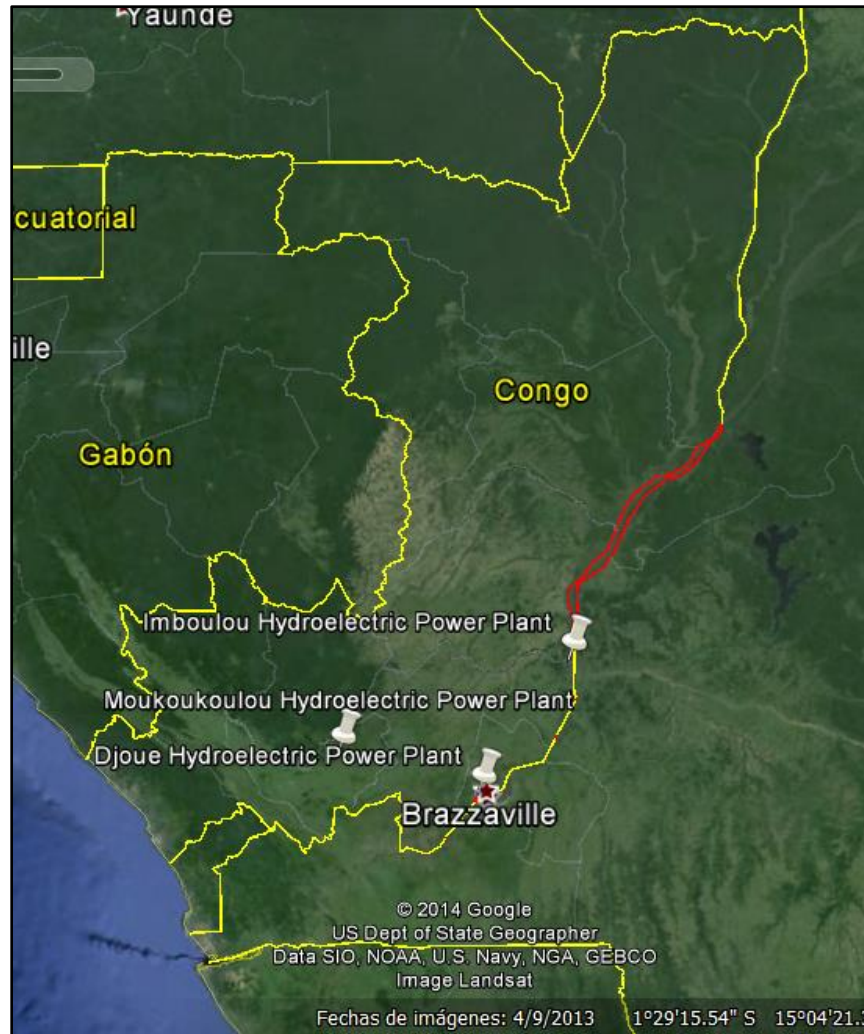
Despite the important river system of the Congo, the power potential is not exploited for the production of electrical energy. Currently the total hydroelectric capacity in operation is 209 MW (for a more detailed location of these projects, see Figure 3):

- Moukoulou hydropower station (74 MW), commissioned in 1979, department of Bouenza.

¹⁰ Decree No 2010-822 of December 31, 2010 on the approval of the development's strategy of electricity power, water and sanitation sectors, Official Journal of January 27, 2011, n° 4

- Djoue hydropower station (15 MW) built back in 1976 is currently undergoing renovation and modernization and will reach a capacity of 30MW¹¹, in Brazzaville.
- Imboulou hydropower station (120 MW), commissioned in 2010, in North Pool department.

Figure 2. Hydro power plants map location in Congo¹²



Large hydropower investments require either proximity to the demand or additional investment for transmission lines. Even if medium size hydroelectric plants are deployed, the very high costs of

¹¹Studio Pietrangeli Consulting Engineers. Available at: <http://www.pietrangeli.com/hydroelectric-plant-Djoue>

¹²Google Earth

transmission and distribution to villages with low density demand makes this solution economically unfeasible because of the high investment costs and also the high maintenance costs of the lines in the forest (transmission and distribution costs vary depending on the type of landscape, distance, extension of the distribution grid, three or single phase distribution etc. For instance, a reference of 50,000 USD / km for 33 kV lines is given for the Republic of Congo; distribution costs can be as high as 2,000 USD/connection).

To have a clear understanding of the different hydropower plants sizes the following definitions will be used throughout the document:

- Small-hydro: from 500 kW to 5MW
- Mini-hydro: From 50 kW to 500 kW
- Micro-hydro: From 5kW to 50 kW
- Pico-hydro: From a few hundred watts to 5kW

Small scale hydropower below 5 MW is unexploited in the country. This Project Document considers small hydro plants (in French: PCH petite centrale hydroélectrique) sized to fulfill the village's electric loads coupled to a local distribution grid. Both the terms SHP based mini grid and SHP based microgrid are used as synonyms.

1.3.5 SUMMARY

As a summary, both Solar and Hydro resources are geographically abundant in Congo, and especially relevant for remote rural areas. Small hydropower-based mini-grids that are sized to the local villages' needs can provide for an economically viable, environmentally sustainable and climate-friendly power supply alternative to diesel based gensets, harnessing the abundant hydropower potential.

1.4 Legal Framework

1.4.1 ELECTRICITY SECTOR REFORM

In 2003, four laws were enacted, defining the new legislative and regulatory framework for the electricity sector in Congo. These are:

- Law No. 14-203 of 10th April 2003, which defines the Electricity Code, stating:
 - The Ministry responsible for the electricity sector defines implements and controls, over the whole country, the National Electricity Policy, through a rational use of energy resources ensuring adequate quality and price conditions for users.
 - That the electricity service will be guaranteed through private initiative, and introducing competitive processes by operators acting on behalf of the state.
 - The generation of electricity is liberalized.
 - The roles and responsibilities of the actors of the sector related to the production, transmission, distribution, import, export and sale of electricity.
- Law No. 15/2003 of 10th April 2003, establishing the National Agency for Rural Electrification (ANER).

- The role of ANER, under the Ministry responsible for electricity, is to ensure the promotion of rural electrification.
- Law No. 16/2003 of 10th April 2003, establishing the Agency for the Regulation of the Electricity Sector.
 - The mission of this agency is to ensure compliance by the stakeholders with laws, decrees, regulations and contracts governing the sector, as well as the relations between actors, whether technical standards, tariffs and other legal and contractual provisions.
- Law No. 17/2003 of 10th April 2003, establishing the Development Fund of the Electricity Sector.
 - The Fund is intended to finance planning activities, capacity building at institutions of the electricity sector and the development of rural communities using new and renewable energy sources.

Other relevant legal references are:

- The 10-2003 Act of 6th February 2003, on the transfer of powers to local authorities, which gives departments and municipalities the role to promote the services of the production and distribution of electricity and promoting renewable energies.
- Law 21-94 of 10th August 1994, on the privatization of the SNE.
- Decree No. 2010-822 of 31st December 2010 approving the development strategy for the sectors of electricity, water and sanitation.

1.4.2 LEGAL FRAMEWORK FOR SHP MICROGRIDS PROJECTS

There is no specific legal framework for rural hydropower-based microgrids in Congo. However, the Electricity Code allows the existence of microgrids.

Regarding use of land and water, the Electricity Code provides two types of servitude, public and private. Regarding the public servitude in land belonging to the State or decentralized authorities, an operator is allowed to perform all required work for the construction and maintenance of electrical facilities which are needed to perform its mandate, provided there is an authorization by the institution who owns that piece of land (Articles 52 and 53, National Electricity Code).

As for the use of the private domain, an approval by the owner of the land is required. But the operator may be authorized by regulation to have access to the private area to develop the necessary project studies. This occupation will, however, be temporary and may not exceed six (6) months (Articles 54, 55, 56, 57, 58, National Electricity Code).

1.4.2.1 Environmental Impact

It is the obligation of every actor in the field of electricity to perform a study to determine the impact on the environment before the implementation of any project (Article 14, National Electricity Code), there is nothing specific for SHP.

1.4.2.2 Independent Power Producer (IPPs)

The rights of independent producers are subject to obtaining a license (Article 42, Electricity Code), but, particularly with regard to small capacity facilities of generation, transmission, distribution and sale of electricity in rural areas, an authorization by the Ministry in charge is sufficient (Article 51, Electricity Code).

1.4.2.3 Financial support and subsidies

The State eventually supports financially the electricity sector; however, subsidies would have to be requested on a project-specific base. Fiscal incentives do not exist.

1.4.2.4 Electricity distribution: Operation and ownership of network

If the State owns the distribution network, it can either be operated by the State or by a private actor subject to certain specifications. Besides, it is also possible for a private investor to build and operate a distribution network, provided a license or authorization is given (Article 9, Electricity Code).

1.4.3 REGULATORY FRAMEWORK – ELECTRICITY TARIFFS

1.4.3.1 Definition of Tariffs

In the national grid, electricity tariffs are governed by the 1994 decree. The Electricity Code states that the pricing of consumer tariffs of electricity is the responsibility of the State (Article 3). Recently (1st July 2014) the government launched a study for structuring of electricity tariffs and demand for electricity in the Republic of Congo. This study is expected to last seven (7) months, it will be financed by the World Bank and implemented by the French firms ARTELIA ENERGY¹³. It focuses on grid connected, but does not include the study of tariffs specific to rural areas.

Independent producers in remote, off-grid areas are allowed to negotiate prices freely with consumers (Article 20).

Regarding regulated tariffs, there are no specific criteria to define them (such as, for rural, remote areas, income level, technology-specific, etc.). According to Article 48 of the Electricity Code the cost of connection, transmission or distribution is defined based on the costs incurred by the operator, plus a reasonable profit.

1.4.3.2 Illegal connections

Illegal connections are generally treated as fraud, but within SNE, each regional agency has different rules regarding the punishment of such unlawful practices. For example, at the Agency in Moundali, the fine for an illegal connection is 140,000 F CFA (266 USD).

¹³<http://www.arteliagroup.com/en/energy/Artelia-specialist-in-renewable-energy-and-energy-efficiency>

1.5 Baseline, barriers and current government policy to address the root causes and threats

The Government of the Republic of Congo 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 Agence Nationale d'Electrification Rurale (ANER) has been created. ANER is the national agency responsible for rural electrification under the Ministry of Mines, Energy and Hydraulic (MMEH). ANER's goal is to improve the electrification rate from 5 % to 50% by 2015¹⁴. But it has to be acknowledged that this goal at this stage seems unfeasible.

The Government has also established the Development Fund for the Electricity Sector and embarked on an ambitious program to improve the energy infrastructure in the country. This program includes major investments in power generation, transmission, and rural electrification, including the recently commissioned new 120 MW hydro power plant at Imboulou and a 74 MW hydropower facility at Moukoulou.

Further, to attract private investment in new power generation and grid expansion, a major restructuring of the electricity sector has been underway since 2003 after adoption of new Electricity Code aimed at creating the enabling regulatory and market framework for provision of electricity services by Independent Power Producers (IPPs), public or private, in a manner, which would encourage private initiative and competition. The reform also created the Power Sector Regulatory Agency, the key entity in charge of tariff regulation for all power producers.

¹⁴ 2006 Drinking Water and Electricity Policy Objectives

Table 2. Summary of baseline conditions, policies, programs and targets

<p>Conditions regarding energy access and SHPs</p>	<ol style="list-style-type: none"> 1. Rural energy access rate: 5 - 16% (depending on source)¹⁵ 2. Rural energy use patterns: use of diesel-based generators (163,000 t/year) and use of kerosene for lighting (13,200 t/year)¹⁶ 3. Installed capacity of SHPs: 0 kW¹⁷ 4. Installed capacity of large hydro power: >200 MW
<p>National rural access target</p>	<ol style="list-style-type: none"> 5. To increase rate of rural electrification from 5 - 16% up to 50% by 2015 (2006 Drinking Water and Electricity Policy Objectives)
<p>Baseline policies and institutions</p>	<p>Electricity sector reform was initiated in 2003 with the adoption of a comprehensive legal package which established new institutional and regulatory structure for power sector, put specific emphasis on rural electrification, and opened up the power generation sector to Independent Power Producers (IPPs), namely:</p> <ul style="list-style-type: none"> • Law #14-2003: New Electricity Code: access to the grid for IPPs • Law #15-2003 establishment of the Agency for Rural Electrification • Law #16-2003 establishment of the Power Sector Regulatory Agency: independent regulatory body in charge of tariffs • Law #17-2003 creation of the Fund for Power Sector Development
<p>Tariffs</p>	<p>A study is underway for the grid-connected service tariffs. Off-grid tariffs are not regarded by this study. However, it can be assumed that rural, remote off-grid tariffs follow the price of diesel, which can reach very high levels in such areas.</p>

¹⁵ only 9% according to the Sustainable Energy for All Tracking Report and the World Bank (other sources mention 16% in 2011 according to the African Development Fund and 5% in 2012 according to the IEA Africa Outlook Report)

¹⁶ Ministère du Développement durable, de l'économie forestière et de l'environnement, 2009. Seconde Communication Nationale de la République du Congo à la Convention-cadre des Nations-Unies sur les changements climatiques (UNFCCC). Available at: <http://unfccc.int/resource/docs/natc/connc2.pdf>

¹⁷ Djoue hydropower station even if only 15MW currently is undergoing an upgrade to become a 30MW hydropower plant, hence in the range of larger hydropower stations.

In spite of on-going efforts by the Government and development partners to promote rural electrification and small hydropower, there has been no significant progress or involvement of private operators in the sector up to now and there are no single commercially-operated small hydropower-based micro-grids in the country. The sector faces numerous problems and barriers, which cumulatively make the risk profile of SHP-based mini grids much higher and less attractive than any conventional power generation project. These barriers are enumerated below.

Legal, regulatory and institutional framework: The current legal framework is a barrier to the development of small hydropower because there are no specific provisions enabling IPPs to implement and operate SHP-based mini-grids. There are a number of critical issues which haven't been addressed under the Power Sector Reform process initiated in 2003, such as land and water use by SHP, tariffs, certification and licensing, procedures for conflict resolution, political uncertainty, incentive measures (especially in the view of SHP completion with partially subsidized diesel oil in an oil-producing country), etc. Institutional and human capacities at all levels (sub-regional, national, departmental and local) are also insufficient (if at all existent) to support rural electrification based on decentralized small hydro power plants with considerable CAPEX. Neither the Agency for Rural Electrification (ANER) nor the Ministry of Mines, Energy and Hydraulic (MMEH), nor the Power Sector Regulatory Agency (FDSEL) have experienced dedicated units, staff and budget to deal with these issues.

Technology supply chain: The technology supply chain for small hydropower in Congo-Brazzaville is in a very nascent stage. There are a few local SMEs capable of installing simple SHP power plants based on imported machinery and turbines, but they lack the technical and engineering capacities to ensure optimal design, installation, commissioning and maintenance. In the rural areas there is only very limited local technical expertise available on how to properly administrate and operate SHP based mini-grids. The low quality and quantity of skilled and competent workers in the power sector adds additional risks and increase the cost SHP operation due to the need to rely on expensive international goods and services, even for basic repair and maintenance.

In addition, import duties for manufactured goods are very high (typically 40%) which again for CAPEX based RE technologies is an additional barrier.

On the other hand, concession holders are subject to the ordinary tax regime, which for example the rate of corporation tax is 34%¹⁸.

Sustainable operation model: Even with a political will to allocate public funds to invest in rural electrification infrastructure, the lack of any experience and business models to efficiently operate isolated mini-grids poses another significant barrier. If this infrastructure would also require recurrent subsidies for operation, FiT or OBA, an additional barrier would be to develop reliable cross-subsidy

¹⁸ Article 122 of Law No 8-2012 of May 11, on the amending finance law for 2012.

mechanisms. Before any large-scale replication can take place a model of sustainable operation, maintenance and management (O&M&M) of SHP and other RE-based mini-grids has to be designed, tested and validated in order to minimize otherwise substantial transaction costs and prove economic viability of operations in remote rural communities. The key aspects of a sustainable service operation scheme that have to be put in place and are currently missing are: efficient tariff structure which adequately covers both at least O&M&M costs without the need of recurrent subsidies; technical oversight over plant operations and service quality; financial management; billing and payment collection scheme; community mobilization, customer relations and conflict resolution procedures (such as in case of lack of payment, vandalism and theft, new unsatisfied demand, service quality, or other regulatory aspects), engagement of productive and anchor clients, etc.

Investment awareness, access to information and perception of risks: Information about the potential and the benefits of small hydropower for rural electrification and development is scarce because of the absence of a single successful and sustainable pilot SHP mini-grid project or any other RE rural mini-grid. The risks of a first-of-its-kind investment are always higher than the risks associated with replication of a reference model and its lessons learned. The public sector is already investing in rural electrification in grid extension and, mainly, in diesel based mini grids but is not considering SHP because of lack of in country experience. The private sector technology providers also do not have the local experience and potential service operators do not perceive government institutions as potential business partners. There is no institution where potential investors or technology providers can obtain the required information and advice on SHP based mini-grid development or opportunities: this is primarily due to the lack of track record on how to promote SHP, as well as weak institutional and human capacity of relevant stakeholders at national (Agency for Rural Electrification, Ministry of Mines, Energy and Hydraulic, Ministry of Environment) and local level. The primary focus and efforts of the Government and its relevant agencies so far have been on facilitating implementation of large hydro power projects with public and IFI financing. Promotion of investment in SHP mini grids requires a different approach, more geared towards local communities, their needs and productive uses, private sector capacity building, developing long term public-private partnerships and open and transparent access to information to enable potential stakeholders making an informed decision. There is very little data about prospective sites, their hydrological, climatic, demand and willingness to pay and other characteristics. Even when such studies exist, they are not publicly available. Basically, there is no single information point where a potential developer can receive required guidance and data to make an informed investment decision. The lack of publicly available information about planned grid expansion adds substantial risks and uncertainties, which negatively impact on SHP commercial viability.

1.5.1 PLANNED GOVERNMENT PROGRAMMES

1.5.1.1 General Objectives

The energy policy objectives, set by the MMEH (“2006 Drinking Water and Electricity Policy”) can be summarized by the following table.

Table 3. Drinking Water and Electricity Policy Objectives

Strategic Objectives	General Objectives	Specific Objectives
Supply of electricity to meet needed quantity and quality parameters, at affordable prices for everyone	Strengthen the electricity generation, transmission and distribution capacities	Reach a 90% electrification in urban areas by 2015
	Intensify the level of rural electrification	Reach a 50% electrification in rural areas by 2015

In particular the specific objective to obtain a 50% electrification rate in rural areas by 2015 is unlikely. The country has now, 2014, still an estimated 5 - 16% of access to electricity in rural areas.

1.5.1.2 National Development Plan 2012-2016

Among the activities planned, the following are relevant to the SHP projects.

Table 4. National Development Plan 2012 – 2016

COMPONENT	PROGRAM	Sub-Program	Project	
INSTITUTIONAL CAPACITY OF THE MINISTRY	Management and Administration Department	Management of material and financial resources	Development of hydropower in rural centers	
			Rural Electrification Master plan	
DEVELOPMENT OF ENERGY RESOURCES	Governance and Institutional Sector Reforms	Launching and managing sectorial agencies	Operation agencies including the National Rural Electrification Agency	
		Restructuring of the energy sector	Support for the reform of the electricity sector	
		Transfer of powers to local authorities	-	
	Infrastructure Development	Improved electricity supply		Extension of the interconnected system for rural electrification
				Electrification of Cuvette West
				Rehabilitation and extension of LV networks in rural centers
				Electrification in Pool Department
		Development of Generation Capacity		Construction of micro and mini hydropower plants
				Finalize the municipalisation
				Construction of the hydroelectric plant Liouesso
		Infrastructure Development for Renewable Energy		Rural electrification by solar panels 100 communities
				Rehabilitation of photovoltaic systems in Niari

1.6 Institutional Framework and Stakeholder Analysis

The energy sector lacks a Master Plan to rationalize the actions throughout the country. The following are the main actors to be considered in the SHP based mini-grids project, other than the Ministry of Mines, Energy and Hydraulic (MMEH).

1.6.1 *AGENCE NATIONALE D'ELECTRIFICATION RURALE (ANER)*

- Creation: Law n° 15/2003 of 10th April 2003.
- Mission: Public service, with managerial and technical mandate, with legal personality and financial autonomy whose main mission is to promote rural electrification. As such, ANER responsibilities include:
 - Planning for rural electrification
 - Carrying out technical and economic studies required for rural electrification
 - Carrying out tender processes to hire contractors for rural electrification
 - Development of tender processes for the operation of rural electrification projects
 - Promoting new technologies for rural electrification
 - Seek funding for rural electrification program

ANER's staff is approximately composed of 2 directors, 3 engineers, 2 senior technicians, 4 technicians, 3 economists and accountants and 2 secretaries. ANER is not fully operational as its Board is not yet operational. An additional drawback is the lack of funding of the agency. Last but not least, there are considerable needs of capacity building of the staff at ANER.

1.6.2 *AGENCE DE REGULATION DU SECTEUR DE L'ELECTRICITE (ARSEL)*

The ARSEL has the mission of being a public service, with managerial and technical mandate, with legal personality and managerial autonomy. ARSEL is under the Ministry of Energy and its main tasks are:

- Participate in promoting the sound development of the electricity supply;
- Ensure economic and financial stability of the electricity sector and the guarantee of the necessary economic conditions for its viability;
- Protect the interests of consumers and the protection of their rights in terms of price, supply and quality of electricity;
- Promote competition and private sector participation in the production, transmission, distribution, import, export and sale of electricity under transparent and non-discriminatory conditions.
- Implement, monitor and control the tariff setting processes, according to methods and procedures established by the authorities;
- Monitor the implementation of standards and measures by operators of the electricity sector;
- Ensure, in the electricity sector, compliance with legislation on the protection of the environment.

As other actors, ARSEL also has weak financial resources and in fact, there is a real lack of private operators to be supervised.

1.6.3 FONDS NATIONAL DE DEVELOPPEMENT DU SECTEUR DE L'ELECTRICITE (FDSE)

The FDSE is a public service, with managerial and financial mandate, with legal personality and managerial autonomy. The tasks of the fund are, principally, to finance:

- Regional planning related to developments of the electricity sector
- Development of human resource capacities in the electricity sector
- Street lighting projects
- Allocate loans to rural communities for the promotion of renewable energy sources.

As the institutions mentioned above, ARSEL is not yet fully operational.

1.6.4 SOCIÉTÉ NATIONALE D'ÉLECTRICITÉ (SNE)

The national electricity company Société Nationale d'Électricité (SNE) was created in 1967 and is the public company operating in the public service of electricity. Although Electricity Code states that electricity generation, transmission, distribution, import, export and sale operations can be made by private entities, the SNE is still the only operator in the sector.

1.6.5 OTHER COMPANIES

Works and services in the sector of electricity are provided by companies that have obtained a license. There are more than 20 companies which have been authorized by the MMEH may be considered for the project components 2 and 3. The list in 8.1 is not a complete list and should be used only as reference; other companies such as "Africa solaire" "Meagle Services Congo", "3 Hommes Energy" among others, work in the field of solar energy.

1.7 Other related Past, Ongoing and Planned Activities

The World Bank is supporting this initiative via a 3 million US\$ component from the “Water, Electricity and Urban Development Project”; aimed at the development of a comprehensive strategy for the reform of electricity sector and improvement of the Government’s capacity to implement the reform.

Also, the African Development Bank has committed 5 million US\$ for the Rural Electrification Project which will connect some 50 rural localities to hydropower based electricity generation plants in Moukoulou and Imboulou.

Further, the Ministry of Mines, Energy and Hydraulic signed a Memorandum of Cooperation with the Hangzhou Regional Center for Small Hydro Power (HRC) of China concerning grid reconstruction and joint small hydropower project development.

Finally, UNDP under its “National capacity building for small-hydro power development and drinking water supply in rural areas” project conducted an assessment of small hydropower potential in the country, including field studies of prospective and producing an Atlas of small hydro sites that identified 17 locations across the country in 2008.

In its policy of improving the living conditions of the population, the Government gives priority to rural electrification of isolated centers, the use of renewable energy (micro hydro and solar PV) and also the interconnection of villages to the national grid (case of “Indian Cooperation” and “AfDB” projects).

The “Electrification of 100 remote communities with solar PV,” by the Ministry of Energy and Water, ANER encourages hybrid solution with microgrids. The generators will be used only when necessary. Thus, it is expected that diesel consumption in rural communities will not increase but rather decrease.

1.7.1 RURAL ELECTRIFICATION (GRID EXTENSION) PROJECTS

Indian Cooperation: The Electrification of Rural Centers Project is part of a National Electrification Program based on extension of the national grid. The electrification of the first 20 towns in ten different departments is being funded by the Indian Cooperation Agency. The project stems from a Memorandum of Understanding signed with the Government of India for the construction of transmission lines and networks of distribution throughout the country in the context of the implementation of its strategy for poverty reduction. The purpose is the construction of power lines of 220 kV and 33 kV. The estimated budget is 300 million USD.

African Development Bank (AfDB) Project: The project, submitted for funding to the African Development Fund, is part of the implementation of the National Electrification Program for the interconnection in five departments (Pointe-Noire, Bouenza, Plateaux, Cuvette and Cuvette West). Its total cost is estimated at 24 million USD. The main expected outputs at the end of 48 months are: (i) construction of 305 km of distribution networks in MV and LV; (ii) the electrification of 59 new locations including two rural communities and two chief towns of districts; (iii) completion of 5,100 connections

or 25,500 persons have access to the power grid by the project; (iv) installation of 2,255 street lights; and (v) strengthening the capacity of public institutions in the sub-sector of electricity.

1.7.2 HYDRO PROJECTS

There is no undergoing or planned small/micro hydro projects, just big hydropower installations, which are highlighted below:

1.7.2.1 Under execution

The Liouesso hydropower plant, on the Lengoué River, is located in the department of Sangha, 86 km from the city of Ouesso on the road Makoua-Ouesso. This power plant, with a capacity of 19.2 MW, is designed to provide electricity especially to the city of Ouesso and other surrounding communities. The work should be completed by 2016.

Power Station Djoué: The rehabilitation and modernization of the plant Djoué, with an additional capacity of 15 MW.

1.7.2.2 Planned Projects

Power Station Sounda: The site is located at Sounda Gorge, on Kouilou River, one hundred kilometers North of the city of Pointe Noire. Its hydroelectric potential is estimated at 1000 MW. Feasibility studies were developed by EDF (France) in 1961 and pre-feasibility studies for a modular plant in 1999.

Power Station Chollet: The site Chollet, on the Dja River, is about 70 kilometers from the town of Ngbala at the border with Cameroon. The project involves the construction of a dam and the potential is estimated at 600 MW. The head is about 100 m with a flow rate of 750 m³/s, rendering an estimated energy production per year of 2,800 GWh. The pre-feasibility study was conducted by the Chinese company Sino Hydro. The two Governments involved in this site, Congo and Cameroon, have established a commission to draft the TOR to seek funding to carry out the feasibility studies.

Power Station Kouembali: Kouembali hydropower site, on Léfini River is about 200 km from Brazzaville. Its capacity is estimated at 150 MW.

Power Station Mourala: Mourala hydropower site, on Louessé River, is located a few kilometers from the town of Mossendjo in the department of Niari. Its hydroelectric potential is 80MW. The studies were conducted by the General Delegation of Great Works.

Power Station Mbama: The Mbama site, on Kouyou River, is in the district of Mbama in the Cuvette-Ouest. The project involves the construction of a 6 MW hydropower plant. The studies were conducted by DGGT.

2 Project Strategy

2.1 Project Objective, Outcomes and Outputs

The Project Objective is to contribute to the Congolese Government's goal of increasing the rate of rural electrification and also to avoid emissions of greenhouse gases by improving the enabling environment of small hydro (SHP) mini-grid projects.

As part of that objective, key roles will be defined and established regarding planning, funding, construction, ownership (legal and operational), operation and regulation. Also mini grid's categorization regarding technology, power capacity, community needs, etc. will be established and taken into account during the different phases of the project.

Electrification is often defined as access of a village to an electrical grid. The problem with this definition is that it implies that electrification has been accomplished once the village has a grid but it ignores the fact that even if businesses and services are connected, households in the "connected" village may or may not be receiving electricity. The definition in the project will consider that a village is electrified when in addition to business and community institutions, at least 10 percent of its households have contracted the service offered by the mini grid operator. The outputs for the project are new individual operating connections to a consumer.

The proposed GEF funded project will be complementary to the baseline initiatives as it addresses barriers that are specifically related to the development of both, decentralized small hydropower plants and rural mini-grids, which are not covered under the baseline.

The project will develop a decentralized track for sustainable rural electrification based on renewable energy generation carried out through nongovernmental entities such as private entrepreneurs, cooperatives, community user groups or NGO's.

Component 1- Policy and de-risking instruments for SHP and RE-based mini-grids

Outcome 1a- Enabling policy and institutional framework for SHP-based mini-grids set up

This component envisages the preparation and adoption of a light and clear policy framework for the development of SHP and other RE-based rural electrification. The framework will complement existing policies on power sector development and rural electrification (i.e. Laws #14-17-2003 mentioned above) by putting explicit emphasis in role definition and more favorable conditions for SHPs. Such policy framework will include specific timeframe and targets for development of SHPs and other RE based mini grids consistent with national rural electrification target (beyond the current 50% by 2015).

Output 1a.1- Policy package to operate and develop RE based minigrids

Activity 1a.1.1 Tailored policy design for RE mini grids

Appropriate policy mechanisms will be developed to support the development of RE –based mini-grids and, particularly, SHP-based mini-grids in Congo-Brazzaville. The mechanisms that will compose such policy will be developed as consultancies, including a Policy gap analysis, a Rural Electrification Action Plan with special focus on SHP, Draft legislation, Licensing models, Public-private partnership agreements, Operator-community agreements. The policy-related work of this activity will strongly count on the collaboration and buy-in of the Government institutions related to the success of the enforcement of such policies (Ministries of energy, but also finance, and also other Government institutions like “Grands Travaux”). Such collaboration will be structured in workshops such as a multi-stakeholder meeting, a specific workshop on rural electrification policy and a final one about tools and methodologies, to be attended by MMEH, ANER, ARSEL and FDSEL and also private institutions.

MGOs (micro grid operators) must be given the legal right to exist and policy must provide clear language allowing micro grid operators to exist within a certain service area, and establish a clear and simple process for them to register this activity. If restrictive or unclear regulations exist the project will consider ways to adapt or update them as this will be easier than starting entirely from scratch. The MGO needs a document that gives it the legal right to operate. This document could be the registration and the grant agreement that gives the MGO the status that may be needed to obtain a bank loan or some other source of financing.

Micro grids that intend to serve isolated rural communities operate on the edge of commercial viability and are not likely to develop unless there is a conscious effort to create a light-handed licensing regulation. The project should continually keep in mind that regulation is not an end in itself but simply a means to an end that is reliable cost effective electricity supplied to unserved rural villages as soon as possible. The regulatory rules that affect rural micro grids will be of three types and will be enforced using different instruments in the project.

Technological decisions are the engineering decision like the safety standards for micro grids that serve retail customers. While the content of these rules is technical, the effects of the rules are both technical and economic.

Economic or commercial decisions set the price that the operator will charge for the sale of electricity, the grants that are available to create the micro grid and the taxes that apply during operation.

Process decisions will specify entry and exit conditions through permits to the process by which the operators fulfill the legal requirements to develop a project and operate. For example, if it a permit, a license, or a concession for the different categories. It should:

- Minimize the amount of information required
- Minimize the number of separate regulatory processes and decisions
- Create standardized documents, with all documents available on the Internet
- Where possible, rely and do not overlap with related decisions by other government or community bodies

To enforce the requirements for the small decentralized electrification in the project it is possible, and

more efficient, than simple rules be enforced by ANER and that community organizations support this activity.

The reality is that the assessment and review that the PMU within ANEL will conduct before awarding project grants and Output Based Aid should ensure that technological and economic aspects of the project meet the minimum requirements. The purpose of the review is to ensure that the DG's revenues are high enough to ensure financial viability. Community level organizations will play the additional role of enforcing quality of service.

Micro grid operators will be able to successfully develop and operate if there is acceptance from the villages that will be supplied. As a light handed regulatory strategy for mini grids, the project will develop the option that beneficiary communities perform basic regulatory functions.

Village-level support will be a requirement to submit an EoI to the project and, if the mini grid project is implemented the private operator to need to sign an electricity service agreement with designated representatives of the village (a village electricity association or a local governmental body) as a form of *regulation by agreement*. Such agreement will specify the rights and responsibilities of the community entity, the individual subscribers and the private operator. Also it will define service parameters such as product quality, hours of required service and tariffs. The PMU will develop a model version of such a contract.

The village electricity association will monitor compliance with the quality of service established and the agency's role will be to act as a mediator or arbiter of disputes over implementation of the supply agreement. A procedure will be established as a way out in an extreme case that the operator neglects his obligations or simply wants to abandon the concession. The project will aim that village women's groups are actively involved in the association's decision making bodies.

Backstop measures to protect village consumers will be developed and include the following:

- Annual reporting. In return for an exemption from the need to obtain the approval for retail tariffs, the operator would be required to file annual reports specifying annual sales, hours of service, number of customers by category, average consumption by customer type, and the tariffs charged by customer category. The reporting will need the preliminary approval of the community.
- Tracking of customer complaints. If 25 percent of the operator's customers report complains about the services, the agency will initiate a review and mediation of the project's operations based on the standards defined on the grant agreements and on the quality of service agreement with the community.
- Registration rather than licensing. ANER would register the project and the agreement with the community rather than issue a license. If the micro grid operator seeks a license with an exclusive monopoly for a defined period of time, then ANER would have the option, of imposing stricter pricing standards on the operator.
- Review after five years. Inspection will be done after 6 months of operation or anytime that the MGO obtains OBA grants to connect new customers. After five years, if the operator seeks extension of its registration ANER will have the option of conducting a review and an evaluation.

The tax regime for the different steps involved in the value chain associated to RE mini grids will be reviewed. This includes from import duties for equipment, sales tax as well as any other national or local taxes that may apply to the operation of the service. A clear policy will be recommended and adopted that contributes to the general policy objectives with regards to rural electrification. Meetings involving the private sector, government agencies involved in the project and the relevant authorities will be facilitated to specifically address the import tax issue for renewable energy technologies. The results of this activity will have to be taken into account when considering investment and operating costs to establish the financial sustainability.

Outcome 1b- Financial viability of SHP mini-grid operation ensured

Besides the cornerstone policy instrument, a financial mechanism (e.g. public investment, cost based tariff for RE-based mini-grids, etc) will be established, including, but not limited to, simplified concession regimes and licensing rules adapted to local costs and conditions, land and water use rights for SHP projects, import tax exemptions, etc. In order to support the implementation of the policy framework proposed in the previous activity, capacity building and technical assistance will be provided to relevant national agencies, ANER, ARSEL and FDSEL and also private institutions.

Output 1b.1- Financial viability mechanism of SHP mini-grid operation

Activity 1b.1.1 Financial mechanism of the project

An explicit OBA or cross subsidy to service operation costs is not considered during the first 2 batches. What is proposed instead, is a mechanism (a scheme) based on subsidies to the capital investment, combined with a cost reflective tariffs that supports O&M&M costs and, eventually partial co-investment.

Long term commercial sustainability is a must to achieve the CO₂ reduction objectives. Rural electrification is costly, and even if a rural micro grid option will be selected as a least cost electrification option, serving isolated communities experiences a gap between full costs and revenues. In benchmarked diesel generator based micro grids the high fuel costs cause that, even if the investment has been supported by grants, the ability to pay of the customers is less than the basic operating costs and recurrent subsidies to the operation are required. In RE based micro grids, the basic operating costs are lower and could be covered by ability to pay if the investment is supported by grants and loans. But even in this case the cost revenue gap may arise if cost reflecting tariffs are not high enough.

Full cost-reflective tariffs are not feasible because the operator's revenue has as upper limit the user's ability to pay and if this financial gap is not closed the micro grid is not commercially sustainable. The strategy that the project seeks to achieve is to compromise the need for commercial sustainability with the objective to achieve universal access to electricity by ensuring that tariffs are within the ability to pay most of the potential customers. With RE based micro grids in general, and small hydro in particular, which have lower operating costs than diesel based, it is possible that grants to the initial investment are used to close this gap and to ensure that cost reflective tariffs are going to be affordable by consumers.

The three ways that the project will achieve commercial sustainability will be:

Reducing the underlying capital costs. By optimizing engineering standards, improving procurement practices and technology supply chain, and developing a light handed legal framework and improving procurement practices (Component 2)

Providing grants to reduce the capital costs. Grants targeted to micro grid development have the objective to benefit customers by lowering micro grid costs and thus lower the tariffs charged to its customers or simply ensuring commercial sustainability to provide access to electricity that otherwise would not be available. (Activity 1b.1.1)

Charging to customers cost reflecting tariffs. Even if investment costs for the micro grid are significantly lowered by grants, sustainable electrification cannot be achieved if the operator loses money on every kWh that it sells to rural customers once the connection is made. On the contrary, the MGO will have a strong incentive to increase the number of connected customers if cost-recovering tariffs are possible and within the ability to pay of customers. (Activity 1b.2.1)

The consultancies that will be developed in this activity comprise a Benchmark of Financial instruments in the region and in the area of RE mini-grids, Assessment of Financial sustainability of Projects, Financial tools set-up, and two workshops are intended, one about Financial Instruments and another one about Financial Sustainability of mini-grids, to be attended by MMEH, ANER, ARSEL and FDSEL and also private institutions.

Activity 1b.1.2 Other de-risking actions

Along with an appropriate tariff structure and public investment and institutional strengthening through TA, other incentives and de-risking actions can be considered at this stage. Some examples are: bundling of several mini grids under one license, insurance and guarantees on assets, legal support to enforce tariff collection and others that are developed during the project to respond to needs identified.

A selection of the most efficient and effective instruments will be made through a Financial de-risking Instrument study, which will analyze best practices in the sector, applicable to the country.

It is suggested to focus on the operators' point of view. For instance, bundling several mini-grids under one license gives operators the certainty of a certain scale of service, thus provides the minimum scale to make the operators' business viable.

Other options to be foreseen in the regulation: extended payment programs. By introducing micro credits to customers paid on their electricity subscription, mini-grid operators could also finance the purchase of productive-use machinery and appliances for their customers and that would lead to more sales, improved financial sustainability and assurance of technical quality of the appliances.

In isolated rural mini grids the load profile plays also an important role on the useful plant capacity factor. If the load profile is essentially domestic and demand is high in the evening but low during the daytime a lot of the generating potential is not retained. In that sense the project will explore new technologies in dynamic meters that limit power to the users in the evening hours and increase it during the daytime to encourage daytime consumption in income generating activities, the load profile is flattened and the plant capacity factor becomes higher.

Output 1b.2- Tariff criteria for RE based mini grids

Activity 1b.2.1 Capacity to pay and costs studies

Setting tariff prices for an adequate energy service is one of the most important factors to ensure sustainability of RE-based mini-grids, both from users and developers perspective.

For MGO that sell electricity to retail customers the two key concerns are setting the tariffs and establishing minimum quality-of-service standards.

Tariffs should be cost-reflective, which means that the total revenues from the tariffs paid will recover total operating and capital costs for both generation and distribution. The criteria for tariffs must be high enough that they will, in a reasonable period of several years, cover operating and management costs and depreciation on all capital investment whether supplied entirely by grant investment (batches 1 and 2) or partially by the operator in equity and loans supported by OBA (batch 3) and provide for reserves to deal with emergency contingencies. Additionally it must earn a return on the equity capital that it had invested in the project. The main justification of considering depreciation of equipment is to be able to replace components as they wear out but the MGO should not earn a profit or return on the grant portion of the equity.

In general, the structure and level of retail tariffs varies widely because of the considerable variation in customer types, scale of the micro grid, geographic factors and, especially technology. For example, at one end of the scale, a large hydropower plant serving several thousands of customers in a dense town will have much lower costs per customer and energy unit supplied than a small PV-battery based micro grid serving a small hamlet. For the hydro based mini grids most of the costs are related to investment and operating costs and a typical tariff structure will be based on *flat rate subscriptions* corresponding to different tiers of service with power and daily energy limits.

The project will conduct a comprehensive assessment and prepare a proposal for tariff setting methodologies applicable to off-grid context, which would at least cover M&O&M costs without needs for recurrent subsidies and, where possible, attract certain level of private co-investment with adequate rates of return. The best way to address the affordability question is to take a close look at the amount of money that rural customers currently spend on sources of energy that could be replaced by electricity from mini-grids. Even when electricity is relatively expensive, the total monthly electricity costs would be comparable to current monthly expenditures on kerosene and candles.

Based on the results of the first batches of projects, a simplified calculation methodology and tool will be created to help develop business plans and to validate the impact of the grants and the revenues. It

will be open to all interested parties and also used to perform calculations to estimate the effect of tariffs and grants for the different categories of mini grids, and also their financial indicators.

The ability of SHP operators to secure required cash flow to recoup their investment, cover O&M&M costs, and obtain a profit will depend on two factors: a) consumer's ability to pay; and b) existence of higher consumption consumers, such as commercial enterprises, willing and able to pay the locally agreed tariff rates. If these conditions are met, the need for public investment is required only to cover partially or totally the capital investment costs for SHP based mini-grids. The project strategy foresees an OBA grant procedure as a roll out mechanism for RE mini grids. In processing the applications for these grants, the PMU will perform a review of the business plan to ensure that the MGOs revenues are high enough so that the operation is financially sustainable. In addition it will take a close look at the affordability of the tariffs that the MGO plans to charge since it is clearly not in the interest of ANEL to give a grant to an entity that will not be commercially sustainable because it does not get enough customers. However, as experiences of other developing countries have shown, with poor clients, the SHP projects can rarely survive commercially on their own, so they might need additional support, community development initiatives (such as enhanced income generating uses of electricity) and risk mitigation measures.

This activity will be strongly linked to the financial mechanism activity. Tariff studies, Socio-economic evaluation based on willingness to pay, tariff setting criteria and recommendations to mini grid operators will be the consultancies to support this activity.

Component 2- Technology and services supply chain

Outcome 2- Capacity to deliver turnkey solutions and quality O&M&M services for SHP developed

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

Output 2.1- Registered technology and service providers

Activity 2.1.1 Initial short list of technology providers

The aim is to help local contractors and service providers to develop their capacity for delivering turnkey solutions. A number of local SMEs will be competitively selected through an open Call for Expression of Interest (Eoi). Capacity building will be provided through training courses and workshops designed by an international consultancy and engineering partner that will deliver such support as part of a technical assistance and backstopping contract. In addition, the project will develop and publish guidelines on

design, installation and maintenance of small-hydropower and mini-grids based on the project's lessons learned and similar experiences in other regions.

For the first batch of sites (see component 3) invitation to offer will be issued to the companies having successfully completed the training that can also partner with international firms to fulfill the tender requirements.

Activity 2.1.2 Enlarged short list of contractors and also service providers

After the first batch of sites has been commissioned (see Component 3) the experiences of the first projects will be shared in workshops about lessons learned and/or site visits in which representatives from financial and investment firms and institutions will be invited to participate. Also, community organizations from the locations (local NGOs, local authorities and commercial/productive users) will be provided with assistance and advice on the relevant aspects of SHP and mini-grid operations and service, such as needs for tariffs to sustain the service, quality and service issues, identification of needs, their role, rights and obligations in a model of decentralized concession.

After completion of this activity a second Call for EoI will be issued to enlarge the short-list of selected firms with new technology providers and also, for service providers and project developers.

Output 2.2- Ownership and operation models selected

Activity 2.2.1 Definition of the technological and concessional scope

This is a cross-cutting activity relevant to the different components of the Project.

There is a need to define the boundaries of typical concessions for the operation of RE mini grids. Aspects to consider, based on international experience are for instance, whether the service is restricted to the potential subscribers which are located within the perimeter of the electrical distribution lines of the SHP, or if a larger area can be defined, based on the geographical and social boundaries of the village (following what the community defines as their village, not limited to the houses served by distribution lines, which may be under economic criteria only). In this case, while businesses and households in the main nucleus of the village can be supplied from the SHP, other potential low power subscribers within a certain distance may become consumers even if serviced using other technologies like individual solar PV, rental of rechargeable lanterns, cell phone charging, etc. It is important to highlight that, in this case, these additional consumers must be included in the operational scheme. This option may provide a potentially more attractive business model as well as ensuring that a goal of universal access to electricity is achieved.

From the technology point of view, it is relevant to define categories based on project characteristics like power capacity, type of turbine technology, number of potential subscribers, village compactness, isolated or partially interconnected (i.e. <5; 5 - 50 kVA (micro); 50 -500 kVA (mini); 500 – 5 000 kVA (small)). Also it may be relevant to establish the several service standards like contracted power, energy level, 24, 12, 6 hour/day, etc.

Some of the projects may be more suitable to certain models and it could be that the regulatory framework, the concession model and tariffs have different requirements depending on project characteristics.

Even if the retail tariffs of isolated micro grids are not regulated, there will still be service standards to ensure safety, quality, and reliability of micro grid operations. These fall into three categories:

- **Quality of product:** Acceptable range of variations in voltage, frequency and harmonics that will not damage customer appliances.
- **Quality of supply:** Schedule of service (hrs/day); maximum frequency and duration of unplanned blackouts.
- **Quality of commercial service:** Time to resolve a complaint, new connection, change of contract category, etc.
- **Safety to consumers:** Electrical safety protection to consumers by adequate circuit breakers at the point of supply.
- **Quality of appliances:** There may also be some limits set to the quality of the appliances that customers are allowed to connect to a micro grid like maximum surge power, reactive power or harmonics. Also the minimum quality of the consumers' indoor wiring.

The project will establish minimum quality-of-service standards. In the first two batches the quality requirements will be included as *inputs* in the engineering design and the technical specifications of the projects that will be tendered on a turn-key and temporary operation basis. It will be an input specification.

As the project evolves towards a privately lead initiative with OBA type grants also the requirements will shift towards *output* standards focusing on the quality of the electric service that is provided rather than the particular technology inputs used to achieve that quality of service and giving more discretion to the developer to optimize his own engineering solution.

Activity 2.2.2 Assessment of institutional models

This activity will assess a few alternative combinations of ownership and service operation models and their appropriateness to the initial market and institutional conditions, i.e. assets owned by government or private entities and operation involving community-based organizations (e.g. SHPs operated by local association of users), government agencies (e.g. operated by SNE or other agency) and/or private operators (technology providers, local service companies and/or external investors) or a combination of the above, with the adequate light regulatory framework and clear operating conditions. Once the model/s are selected it will serve as reference to be tested and validated during in the roll out phase and optimized. Some of the projects may be more suitable to certain models and it could be that both the regulatory framework, the concession model and tariffs have different requirements depending on project characteristics (see activity 2a.2.1).

Output 2.3- Capacity Development and Training of registered technology and service providers

Activity 2.3.1 Capacity building program design and monitoring

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

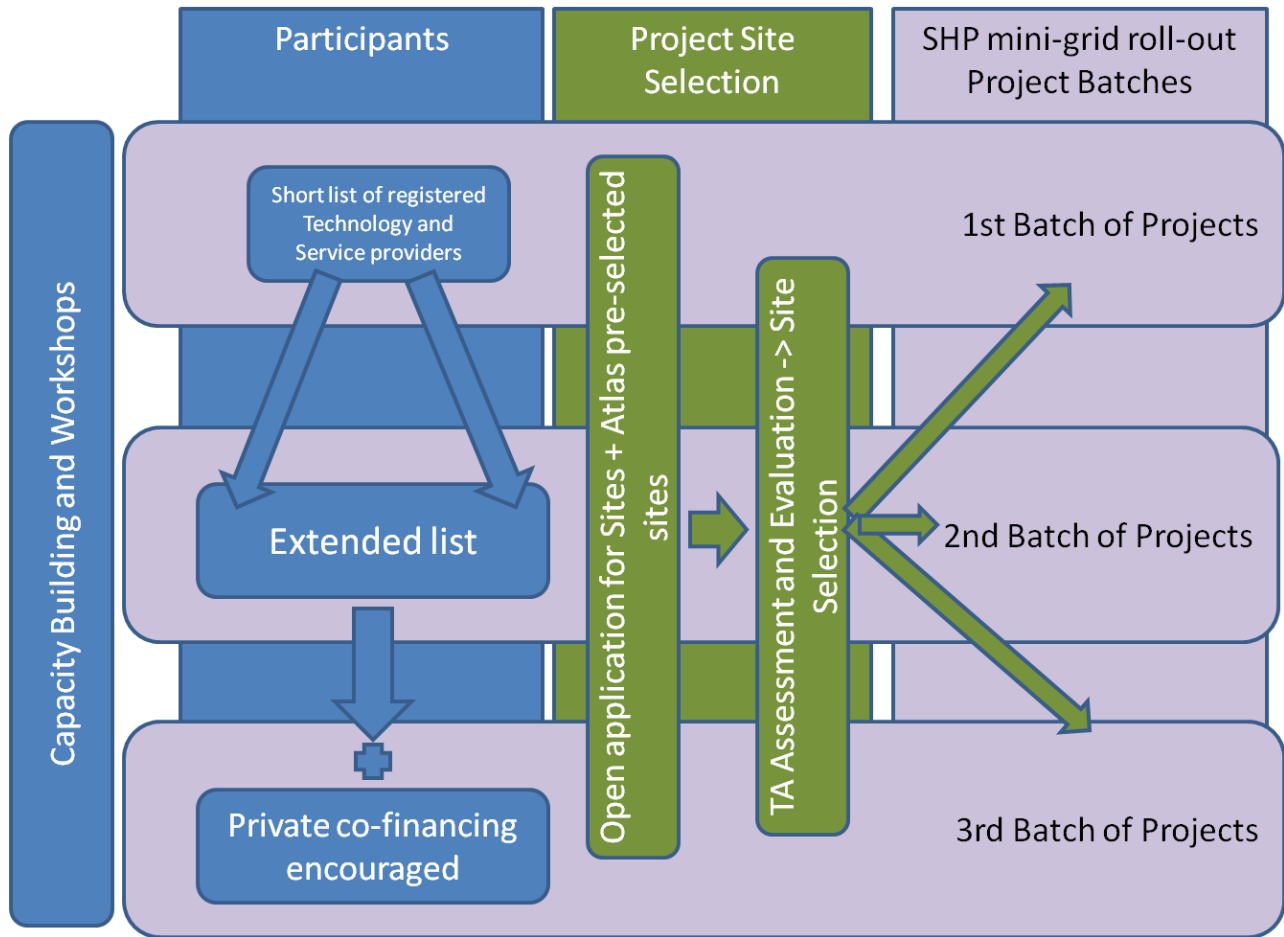
In order to meet the capacity building needs, both initial training and continuous feedback from the project results must be implemented. On the otherhand, allskill levels must be taken into account, including technology providers, Government, local institutions, service providers and financial institutions. The demonstration component of the Project (Component 3) will be essential to develop and test such instruments with a practical approach.

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

Component 3- SHP-based mini-grids roll-out

Outcome 3- Improved confidence in the technical and financial viability of SHP-based rural electrification

Figure 4 – 3-Phased deployment diagram



The expected outcome from this component is the improved confidence of national and local government, communities, contractors and potential developers in the equipment and service quality, technical and economic viability of SHP-based mini-grids for rural electrification and local socio-economic development as an alternative solution to diesel genset-based mini grids and centralized grid-expansion schemes.

The implementation of several projects will also be key to support development of the technology supply chain capacity (Component 2); demonstrate and tailor the appropriateness of proposed policy

and de-risking instruments (Component 1); and provide valuable practical information on the suitability of the long term operation models that have been developed.

Component 3 will be split into three batches of projects, for a total of up to 4 MW of SHP-based capacity, and a target of 17villages. The Component 3 will be supported by a complete set of consultancies that will be developed at every Batch, with different levels of depth and tailored to the scope at each Batch. Technical Assistance will be provided for feasibility studies and technical specifications-tender preparation, supervision of works, tariff setting per microgrid, operational model implementation. Information sessions and workshops will be organized to share lessons learned and train participants (Informative Sessions about site selection criteria, at each batch, and one Workshop with Lessons Learned at the end of each batch).

The amount of projects and specific sites to be developed will be selected during the initial stage of the project in order to do a proper and updated assessment on the sites to be selected and also to ensure that size of the project is in-line with the energy demand from adjacent communities. As an initial reference a mix of sizes has been assumed to allocate accordingly to the budget available for financing works and using costing estimates from IRENA¹⁹ and state of the art sector costs assuming different size projects:

- Pico-hydro: 8 sites for a total of 5 kW
- Micro hydro: 8 sites: for a total of 50 kW
- Mini hydro: 3 sites for a total of 500 kW
- Small hydro: 2 sites for a total of 1000 kW

This adds up to about 4MW, the differentiation capacity-wise is made since normalized investment costs are very sensitive to size, technology used, accessibility, among other variables. For such, the aforementioned estimate is to be considered as indicative of the amount of installations to be carried out. As an initial estimate 185 villages is an average reference.

It must be made clear that the above costing includes the transmission cost, from the SHP transformer to the village, and the distribution costs in the village, as an assumption. The cost of transmission and distribution will be included into the economic component of the site selection criteria in order to optimize the investment (e.g., in some cases, it may be possible to build a bigger SHP, however, the demand of the closest village may not be as high as to make that project sustainable because of the low capacity factor).

Output 3.1- Selected project sites

¹⁹ IRENA, 2012. Renewable Energy Technologies: Cost Analysis Series. Volume 1. Power Sector Issue 3/5. Hydropower. June 2012. Available at: <http://bit.ly/1Dgvxk2>

Activity 3.1.1 Selection criteria

The objective is to establish an objective set of criteria, based on merit, to assess and prioritize candidate sites. This will be developed by the PMU with the assistance of the international backstopping TA. A score methodology with weighted parameters is suggested; this must include but is not limited to technological, economic, social and environmental criteria.

Examples of these criteria would be: power capacity, cost-benefit analysis of the SHP, the demand of its adjacent village/s, socio-economic impact, demand analysis and forecast, potential for replicability/scaling-up, potential avoided GHG, willingness to pay, expected tariffs, existing electrical infrastructure, know-how, local co-financing, etc. The aforementioned can be grouped into a methodology to provide an unbiased and objective evaluation methodology to prioritize project sites. Each of the criteria can be pegged to an indicator that together and in-line to Congolese Government's policy and country priorities will help select the sites.

A set of sites have already been identified in the Atlas developed by UNDP few years ago. The promising 17 sites with their capacity are summarized in the table below.

Table: ATLAS of micro hydro sites in Congo Brazzaville

#	Location	Region	Type	Average flow rate (m ³ /sec)	Head (m)	Site Capacity (kW)	Annual Generation (kWh)
1	ELOUO	PLATEAUX	Run of river	0.47	333	6	37,515
2	OTSENIE	CUVETTE CENTRALE	Run of river	5.68	331	87	571,590
3	ETOUMBI	CUVETTE OUEST	Run of river	7.84	347	123	808,110
4	MAMBOUANA/BAKA	LEKOUMOU	Run of river	28.1	424	425	2,789,096
5	MADOUNGOU	BOUENZA	Run of river	2.49	531	99	650,430
6	TSIAKI	BOUENZA	Reservoir	0.34	531	200	1,314,788
7	KINDOUNGA	BOUENZA	Dam	1.93	184	24	157,680
8	LOUVAKOU	NIARI	Run of river	7.03	201	213	1,399,410
9	MILA MILA	NIARI	Dam	14.85	105	194	1,272,938
10	MANZI	KOUILOU	Dam	4.59	25	76	497,021
11	MOUNGOUNDA	NIARI	Run of river	199.7	281	23,500	154,395,000
12	ZANAGA	LEKOUMOU	Reservoir	2.27	407	200	1,314,000
13	ASSOUMOUNDELE	SANGHA	Reservoir	14	202	6,180	40,602,600
14	BELA	POOL	Reservoir	3	260	3,180	20,892,600
15	KIMBANDA	POOL	Dam	8.2	250	4,020	26,411,400
16	KIMPANZOU	POOL	Run of river	56.8	380	5,510	36,200,700
17	KINDAMBA	POOL	Dam	1.9	437	18	119,968

Based on the ATLAS developed by UNDP, the following sites are the most promising: Madoungou; Tsiaki; Bela; Kimbanda; Zanaga; Assoumoundélé; and Kimpanzou. On these sites, rivers display water falls

between 4m (Louati River) and 108m (Louvoumbi River). One might consider installing at moderate costs of a water diversion system or a run-of-river system.

Activity 3.1.2 Call for candidate sites and selection

This component will be based on a bottom up approach and mainly considers sites selected from an evaluation following an open application call addressed to any potential beneficiaries (municipalities, NGO's, developers, etc.) that already have identified and preliminary assessed candidate sites and also sites identified in the Atlas developed by UNDP (*Atlas Des Sites Micro-Hydro du Congo, 2008*).

The sites will be assessed and evaluated by the project management with the support from the international TA and backstopping consultancy using the objective criteria. The selected sites will be listed according to the merit and approved by the project.

Output 3.2- First batch of sites built and operating with short term concessions

The project will implement a first batch of commercially operated SHP-based mini-grids. The first batch phase will focus mainly on smaller capacities

Activity 3.2.1 Terms of Reference and Call for tenders

The technical feasibility, design and specifications of a first set of SHP mini-grids will be prepared in line with best international practices and standards by project consultants and the PMU will issue a Call for tenders to short listed companies (technology providers) that will be invited to submit a proposal according to UNDP procurement procedures (typically an ITB). The short list will be based on Output 2.1- but enlarged with an EoI addressed to international firms.

Each SHP based mini-grid will be one lot so that smaller firms can opt also to present a competitive offer. In this first batch, the tender requirements will include also a mandatory requirement for at least one year of operation, including tariff collection, service monitoring and reporting.. Additionally, the tariff consultancy will be required to review the tariff structure that is adapted to the technology is robust, ensures sustainability and is within the willingness to pay for each village.

Activity 3.2.2 Construction and 1 year operation

During the installation of the SHP, the project team will be involved in works supervision, GEF funding will be used for additional support by the project's TA to the firms and ANER as part of the capacity building strategy. After commissioning of the SHP, the operation during one year (under a temporary concession) will provide a track record. After the year of operation is completed, concession can be awarded to the technology provider or transferred to a service company. GEF resources will also be used to cover their initially higher O&M&M costs by providing the required training and institutional support to mini grid operators.

Output 3.3- Second batch of sites built and operating with short term concessions

Activity 3.3.1 Terms of Reference and Call for tenders

A second tender will be issued six months after the first with another batch of sites. The technical feasibility, design and specifications of a second set of SHP mini-grids will be prepared in line with best international practices and standards by project consultants and the PMU will issue a Call for tenders to short listed companies (technology providers and service providers) that will be invited to submit a proposal according to UNDP procurement procedures (typically an ITB). The short list will be based on Output 2.1-.

The tender specifications and requirements will be engineered by the TA according to each site's characteristics and the requirements updated with the lessons learned since at this stage some of the first lots of the first batch will have already been commissioned. In this second call, service companies will also be invited in addition to technology providers. The ITB will be issued to encourage proposals with technological and service partnerships.

Activity 3.3.2 Construction and 1 year operation

During the installation of the SHP, the project team will be involved in works supervision, GEF funding will be used for additional support by the project's TA to the firms and ANER as part of the capacity building strategy. After commissioning, the one year of operation as a temporary concession will provide additional track record of villages with possibly different characteristics. GEF resources will be used to cover the required training and institutional support to mini grid operators.

Output 3.4- Third batch of sites built and operating with long term concessions

Activity 3.4.1 Terms of Reference and Call for tenders

A third batch will be launched for the rest and new sites according to the available budget. At this stage and based on the lessons learned and the business model demonstrated, different requirements will be introduced to enhance private co-financing. The technical feasibility, design and specifications of a third set of SHP mini-grids will be reviewed in line with best international practices and standards by project consultants and the PMU will issue a Call for applications to short listed companies (Project developers and service providers) that will be invited to submit a proposal for development and medium-term concessions and will be offered an OBA that will have a different subsidy level for the different SHP mini grid categories. Grant agreements will be signed with the selected projects based on the developments in the "Output 2.2-Ownership and operation models selected".

It is also expected that the capacities of the projects will increase from pico and micro sites in the first batch to mini and small sites in second and third batches and developers will co-finance part of the investment in equity and debt.

Output 3.5- All sites operating with long term concessions

Activity 3.5.1 Upgrade of short-term concessions to long-term concession

It is expected that, by Batch 3, operators of Batch 1 and 2 will be reaching the end of their short-time concession. The possibility to upgrade to a longer concession will be offered to Project Developers or Micro grid operators identified through the project.

Assistance will be provided to the Government facilitating the signature of tariff agreements with the subscribers, concession agreements, and monitoring activities to ensure that the first SHP projects in Congo-Brazzaville provide references for scaling. Also, the project will work with local and international financial institutions and facilities (such as the AfDB Sustainable Energy Fund for Africa) to facilitate access to affordable loan financing for replication projects.

Component 4- Public Relations and promoting investment

Outcome 4- Increased awareness about SHP based mini-grids potential and investment climate

This component will address the informational barrier. It will establish a national SHP Mini-Grid Project Facilitation Center (that is, a centralized bureau for SHP mini-grid information and promotion) for RE rural electrification developers within the National Agency for Rural Electrification or other appointed national entity. Based on the projects results and best practices, assistance will be provided to collect and present all essential information for potential SHP based mini-grid developers and operators, such as a) prospective sites and their characteristics; b) required process for permitting and licensing; c) policies and regulations governing project development; d) information about local technology service providers; e) potential sources of financing, incentives and public investment plans.

The information will be presented on-line and published as a SHP investment guide; although internet access rate is still very low in the country (two fundamental reasons are the high running costs and poor quality of services) most companies in Congo do have internet access, so it is realistic to provide such an on-line tool. Also support will be provided to assigned national entity to ensure its regular update and wide dissemination. The project will also promote investment opportunities among local and foreign partners, financial institutions, developers, social impact investors via targeted PR campaigns, conferences and other marketing and communication tools.

Output 4.1- RE Mini-Grid Project Facilitation Platform(PFP) established

Activity 4.1.1 Establishment of the PFP

The activity will target the development of the institutional structure and human resources necessary to establish and run the Facilitation Platform. The Platform will focus its activities on RE based mini grids of multiple generation technologies (SHP, Solar, Biomass) as well as multiple models (Government, Private, Community, mixed, etc.). It will be the reference to access information about the SHP existing projects, pilot projects developed during the Project batches and to update information in the future. The Platform will be a valuable resource to gather the knowledge generated during the project and also to

offer future beneficiaries Government and operators information to develop new projects (site information, financial resources, socio-economic information etc.).

Activity 4.1.2 GIS model for the RE Mini-grid PFC

A strong tool based on GIS will be the basis of the Platform: GIS will be the core of the information to be managed within the PFC. A consultancy will be conducted to develop the infrastructures of the information to be implemented with GIS. The GIS experts will make the system operational, incorporating and building upon the Project development. They will shape the GIS platform using information from projects developed throughout the batches, capacity building activities performed during the Project, lessons learnt etc.

Market data will be a key requirement for success in mini grid projects. The feasibility study of the hydro potential of the site will need to be complemented with data on how many customers can be expected and how much is their ability to pay for electricity. Gathering market information and providing access to it are two areas where the PMU will need to focus initially before micro grid developers see the benefits and start to invest in collecting its own market data and making their own business plans.

- A list of micro grids showing location (using GIS coordinates), technology, and generating capacity, number of subscribers, etc. that have applied for an EoI, received provisional and final approvals, and the expiration dates of the approvals
 - A list or map of areas that are likely to be “potential sites” to micro grids

Mapping of the renewable energy resources in the country. These might take the form of spatial assessment of small hydropower sites in the country associated to potential electricity consumers, solar insolation maps, maps of distribution of biomass of different types.

Activity 4.1.3 Promotion Campaign

For replication, the project will disseminate the results of the project among Parliament and Government to advocate for long term political and budget commitment. Based on the success of the project, in particular output 2.2, replication of the mini grid model can be extended as well to villages that have other potential RE sources to generate electricity.

As well, the project will seek to disseminate information among the potential target communities through communication channels such as radio, printed documentation, events and also seek to establish information channels in the different regions of the country. In such ways, potential beneficiary communities can approach the program and seek advice or apply for potential project development. This can be done following periodic Calls for Proposals of projects, which could be based on the RE-Mini-grid Project Facilitation Platform, in which the communities describe their energy needs, a selection of the highest priority sites is made and then a Tender is opened for the final engineering solution, construction and operation.

2.2 Project indicators, Risks and Assumptions

Indicators

The key success indicators for the project are:

- Number of subscribers electrified (households, businesses, community services)
- Number of villages electrified
- Metric Tons of CO₂ avoided
- Number of SMEs active in the sector

Further details on the related targets for the project are detailed in Section 3 which contains the project's results framework.

Risks

The main associated risks for a successful implementation of the project are:

- Climate: impact of climate change on SHP will be considered in SHP project design based on Climate models. Also, complementary solutions (e.g. solar back-up generation for dry season) may be included.
- Technological: technological failures due to insufficient quality of locally produced equipment inadequate proposed solutions, improper measurements or data collection, untailored technological dumping solutions (e.g. providing technology with environmental performance below international standards).
- Financial: budget constraints in the government, lack of support /interest from potential private co-investors.
- Market/Economic:SHP will have to compete with subsidized and locally available diesel alternatives. Besides, limited capacity and willingness to pay from potential users, project does not provide/assess/consider development opportunities for income generating activities.
- Policy: 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.
- Political:Potential political instability exists.
- Social:Lack of interest from communities to support the project, inadequate assessment that do not portray/represent communities necessities (misrepresentation), limited technical capacity, project actions/activities are not oriented towards different community cultural contexts.
- Organizational:Lack of coordination between different stakeholders, lack of leadership from SHP project office, lack of coordination with local community authorities, top-down approach from

donor agencies, planning and execution of project lacks of consultation with local communities and civil society.

- Operational: limited personnel capacity to adequately implementing the project within the PMU, limited involvement in rural areas and actions become office-centered and not on the field.

For description of risks in more detail, allocating probability and impact indicators to each, please refer to Annex 8.2 Offline risk log.

Assumptions

Political engagement to support the project is essential, including public investment and a clear mandate on the required policy actions. The project should focus on developing appropriate tools, procedures, methodologies, mechanisms and other initiatives required for a transparent, clear, traceable, and replicable initiative. It is important that the project is created with a strong international TA support initially, but is targeted as a gradual process where actions will be taken over by the executing agency (office) with international backstopping TA. The project should seek for channels that will strengthen the local capacities, for example providing capacity building activities to local SMEs and easing their participation as small businesses in tendering process (e.g. tendering lots separately).

The project should focus on a clear and objective methodology that supports in the decision making processes for selecting communities and project development. The different sectors involved should be engaged at an early stage, and in particular local communities and private entities.

2.3 Expected Global, National and Local Benefits

Global benefits

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

National and local benefits

With regard to direct GHG emissions from the projects, socio-economic analysis conducted by UNDP in a number of potential SHP sites reveal the following baseline energy use patterns:

Kerosene is the primary source of lighting for households,

- For other electricity needs, disposable batteries and rechargeable batteries are in common use, which are either charged on-site from diesel gensets or require long travel (over 20-30 km) to nearby centers for recharge.
- Thermal generators exist in some of the locations to supply power to community centers (hospitals and schools) and SMEs (companies dealing with processing of agricultural, fisheries, livestock and forestry products, as well as local carpentry production). Access to energy is essential to strengthen these SMEs and improve prospects for local economy growth. Under business as usual, their GHG emissions will likely increase, because in that case they can only rely on diesel and other fossil fuel based energy to continue operations and grow.

The project does not intend to benefit timber and forestry exploitation enterprises. These enterprises are usually larger and their energy demand exceeds the proposed range of SHPs. Other suitable ways are needed to promote environmentally sustainable business practices within these enterprises, but this is out of the scope of the proposed GEF project.

In this context, project-supported SHP electricity will replace fossil fuel consumption, mainly use of diesel for power supply to community facilities and will result in direct GHG emission reduction in the amount of 13,770 tCO₂eq/year or about 275,414 tons CO₂ eq over the technology's 20 years lifetime. The estimates are based on expected average power generation by a total of 4 MW of SHP plants and considering a capacity factor of 50%, and emission factor of 0.786 t CO₂eq/MWh²⁰. Considering the US\$ 1,944,133 from the GEF as support for this project, the unit abatement cost is about 1,944,133 / 275,414 = US\$ 7 per ton of CO₂ reduced, only for the Direct Emission reduction.

Besides, the Indirect emission reduction can be calculated, considering that the financial instrument that will be put in place, the development of the value chain of the sector and finally, the establishment of a working Platform for the promotion of RE-based minigrids, will at least, enable the implementation of the remaining sites among those identified in the Atlas. This amounts to 40 MW (out of a total 44 MW, of which 4 MW will be installed during the project and have been accounted for the Direct emission reductions). The same capacity factor assumptions lead to a reduction of 144,529.56 t CO₂ eq/year, and during 20 years lifetime, 2,891,851 tCO₂ eq.

2.4 Project Rationale and GEF Policy Conformity

The project is contributing to GEF Climate Change Focal Area Objective #3 to “Promote Investment in Renewable Energy Technologies”, recognizing that:

²⁰ SHP-based mini-grids will primarily replace diesel fuel generators with emission factor of 0.786 tCO₂/MWh

- Although the focus of this objective in GEF-CCM 3 is focused on investment in Renewable Energy Technologies in general, the project focuses in SHP (hydro resource), in alignment with national priorities
- In order to ensure the success of the project, the whole value chain of SHP has to be involved, from institutions that set the regulatory framework, to the companies, local and international, which eventually implement the projects.
- The project will support policy, regulatory and financing framework for investment in SHP-based grids, with a particular focus on the definition of a cornerstone policy instrument (e.g., SHP-specific tariff).
- The specific outcomes of the GEF 3 climate change strategy that the project is addressing include:
 - SHP specific policy and regulation in place
 - Increase in the renewable energy (hydropower) capacity installed by facilitating investments
 - Electricity generated using hydropower, by implementing successful models of operation that ensure the sustainable delivery of the service.

2.5 Country Ownership: Country Eligibility and Country Drivenness

The proposed project is in line with the following national strategies and plans:

- National Development Plan 2012-2016 specifically calls for the needs “to improve the electricity coverage rate in rural areas with appropriate energy (solar, wind, and pico- et micro-hydroelectric plants)” among key national priorities in 2012-2016;
- Second National Communication identified the development of hydro power electricity generation as the main mitigation measure and priority both under “Energy” and “Technology Transfer” windows;
- National Portfolio Formulation Exercise (NPFE): This project is among the priority GEF-5 CCM projects stated in the National Project Formulation Document (NPF). The NPF specifically states UNDP as the GEF Agency for this project.
- Technology Needs Assessment (TNA) Report commissioned by the Republic of Congo in 2009 lists hydro power (both large and small hydro power) as the first priority technological option the country can deploy to simultaneously reduce GHG emissions from fossil fuel use and deforestation, as well as to improve the rate of rural electrification thus contributing to national socio-economic development priorities. As such, the proposed project is fully consistent with recommendations of TNA report.

2.6 Financial Modality and Cost-Effectiveness

From the total requested GEF financing of 1,944,133 US\$, 1.8US\$ million have been allocated for use as technical assistance and investment type of activities in accordance with the Project Results Framework, set-up of local project office and capacity building activities. A total of US\$ 144,133 i.e. less than 8% of the total budget will be used for project management.

The combined direct and indirect global benefits of the project have been assessed at over 774 kilotons of CO_{2eq}. With a GEF funding request of US\$ 1,944,133, this corresponds to an abatement cost of less than US\$ 3 per tonne of CO₂ reduced.

2.7 Sustainability (including Financial Sustainability)

From technical and economic points of view, the sustainability of SHP-based power generation has been proven in the international market, both in the context of developed and developing countries. Also the sustainability of RE based mini-grid operation is being demonstrated internationally for different technologies and different village sizes and needs. By addressing the underlying policy and barriers that impede the development of SHP based mini-grids in Congo, the creation of a sustainable niche will be realized. Financial operational sustainability will be ensured via the introduction of cost reflective site specific tariff structure, and will seek support from other mechanisms like public investment/subsidy of the initial investment to ensure an affordable tariff. Implementation of demonstration projects will allow assessing viability, test and optimize the model. Results will feed into the design of comprehensive policy package for the promotion of SHP-based mini-grids for rural electrification, including sources of funding to enable continuation and gradual phase-out of the scheme after completion of UNDP-GEF project. In addition, the project will support the integration of local industries and organizations into the SHP sector by addressing capacity needs of all actors across the entire SHP value chain. This will be achieved through the provision of focused support to local engineering firms/specialized engineering workshops for installation, maintenance and repair of electro-mechanical equipment.

2.8 Replicability

Potential for scaling-up: With Congo's large, but unexploited potential for hydro power development, there is a substantial scope for replication and scaling-up investment in SHP-based mini-grids, especially for rural electrification where 95% of customers are yet to be served. The project will enable large-scale replication by removing underlying policy, technical and financial barriers to investment in SHP-based mini-grids and also for other RE based mini-grids like solar PV or multi source. In order to do so, it will adopt a three-pronged approach. First, it will introduce policies that favor-mini grid, which will significantly reduce the risks of operation of SHP based mini grid projects and thus reduce the cost of recurrent subsidies. Second, it will support technology supply chain including O&M&M, which will reduce investment costs and also bring down the cost of running and exploitation of the service. The residual risks will be mitigated via introduction of cost reflective viable tariff for SHP-based mini-grids and identification of appropriate funding sources for the investment. By removing policy, financial and technical barriers, and especially by providing pilot projects and ground for development of local companies, the project aims at linking this vast supply potential with equally sizable demand.

2.9 Innovation

The project has several distinctive features, which makes it highly innovative. First, it will focus on identifying and supporting private sector and bottom up-led SHP mini-grid projects (as opposed to traditional public top down approach), thus maximizing long-term financial and operational sustainability. As opposed to traditional approach of delivering readily-available turn-key solutions, the project will use the demonstration project component to build up capacity across the full technology and services supply chain. Finally, the methodology of implementation by phases introduces a self-learning feedback that accelerates the integration of lessons learned during the project.

3 Project Results Framework

This project will contribute to achieving the following Country Programme Outcome as defined in CPAP or CPD:

From CPAP (2013), Component 3: Environment, crisis prevention and recovery and management of natural disasters and risks > Output 2: Strengthening the capacities to Plan and Manage issues related to the environment, lower cost energy sources and, namely, climate change adaptation.> Strategy 1: Support the development of national documents and strategies (...) through interventions in (...) the development of energy in rural areas through pilot projects to promote new and renewable energy sources (especially hydro power plants)

Country Programme Outcome Indicators:Level of Greenhouse Gas Emissions

Documents and policy about energy management and adaptation to climate change

Primary applicable Key Environment and Sustainable Development Key Result Area (same as that on the cover page, circle one):

1. Mainstreaming environment and energy OR
2. Catalyzing environmental finance OR
3. Promote climate change adaptation OR
4. Expanding access to environmental and energy services for the poor.

	Indicator	Baseline	TargetsEnd of Project	Source of verification	Risks and Assumptions
<p>Project Objective²¹</p> <p>To trigger investment in small and micro hydropower-based mini-grids for rural electrification in Congo-Brazzaville</p>	<p>Investment in SHP mobilized in comparison to baseline year 2014</p> <p>Amount of reduced CO₂ emissions by the investments facilitated by the project (in rural electricity generation compared with the baseline)</p> <p>Number of kWh produced under the project</p> <p>Number of people in rural areas benefiting for access to better energy services</p>	<p>0 USD/year (2014)</p> <p>2014: The baseline assumes that all new demand for electricity will be met by diesel generators.</p>	<p>By end of the project – Year 4 (EOP): a total of 17,500,000 USD of investment from the private sector, government and multilateral aid organizations</p> <p>EOP: 275,414 tCO₂</p> <p>EOP: 17,520 MWh/y</p> <p>EOP: 10,000 people in selected sites benefiting for access to better energy services</p>	<p>Monitoring and reporting on total SHP investments triggered by the project</p> <p>M&E Framework</p> <p>Monitoring and Reporting of yearly generation of installed Pilot SHP (kWh)</p>	<p>Private investors' interest is lower than estimated</p> <p>Co-financing from government and Multilateral institutions is not materialized</p> <p>The installed capacities are lower than estimated.</p> <p>Downtime of SHP projects identification and construction is lengthier than expected</p> <p>Climate change affectations to hydrology which lowers the expected electricity output</p>

²¹Objective (Atlas output) monitored quarterly ERBM and annually in APR/PIR

	Indicator	Baseline	TargetsEnd of Project	Source of verification	Risks and Assumptions
Outcome 1a²² Enabling policy and institutional framework for SHP-based mini-grids set up	Draft and submission of SHP-specific policies and regulation Number of new policies or regulation for rural electrification and SHP, for aspects such as: 1. Rural electrification policy 2. SHP generation concessions 3. Exploitation of the resource (water) for electricity generation 4. Microgrid (off-grid) operation conditions and obligations 5. Tariff setting methodology for RE-based rural independent grids 6. Site selection prioritization tool	0 SHP specific policy and regulation 1. Absence of a rural electrification policy 2. Absence of SHP-specific generation law 3. Law about private/public land/water use exists 4. Electricity Law: microgrids are contemplated 5. There are no tariffs specific to rural microgrids 6. There is no procedure for selecting or prioritizing communities to be	At least five newly drafted and submitted for approval by government of SHP specific policy and regulation such as: 1. Rural electrification policy drafted and presented 2. Law drafted governing SHP generation 3. Reviewed Law governing use and exploitation of land/water for SHP 4. Reviewed Law governing microgrids, operators etc. 5. Tariffs setting methodology/process for rural microgrids, and SHP studied and approved 6. Established procedure on site selection and	MMEH publishes the Policy and regulations Development and submission to Government of the laws/recommendations Proof of participation of staff on capacity building activities	Country priorities for policy and regulation on rural electrification are shifted to other issues New regulation is not adopted by government

²²All outcomes monitored annually in the APR/PIR.

	Indicator	Baseline	TargetsEnd of Project	Source of verification	Risks and Assumptions
	Capacity building for relevant government agencies on the established regulatory framework for rural electrification	electrified National agencies staff will have to be trained on the newly developed policy and regulatory framework developed	prioritization Capacity Building Programme created and implemented to at least 30 government officials of four agencies (ANER, ARSEL, FDSE, SNE) on the newly developed policy and regulations		
Outcome 1b Financial viability of SHP mini-grid operation ensured	Financing schemes for SHP mini-grid have been set-up Amount of money leveraged by financial schemes	No sustainable financing schemes for SHP	At least 1 sustainable financing scheme for supporting 1 million USD investment	Monitoring and reporting on cashflow of SHP set-up	Financing schemes are not properly identified
Outcome 2 Capacity to deliver turnkey solutions and quality O&M&M services for SHP developed	Official guidebook on SHP technologies Workshops on SHP and rural microgrids, capacity building for SHP manufacturers Number of Short-listed companies	Non-existing Non-existing Non-existing	1 At least 1 workshop per pilot SHP developed and 1 workshop on operation and management models At least 4 local companies short-listed and participating in SHP Pilot project Bids	Publication done by UNDP Workshops are organized and open to short-listed companies, other companies and academia Results of the bidding process for short-listing companies	The Local companies in the sector are not interested in capacity building activities and bidding for projects

	Indicator	Baseline	TargetsEnd of Project	Source of verification	Risks and Assumptions
Outcome 3 Improved confidence in the technical and financial viability of SHP-based rural electrification	Number of SHP projects installed, in operation (commissioned), and with established operational model set-up according to developed framework	0 SHP projects installed	6MW of SHP (different capacities – <i>pico, micro, mini, small</i>)	Proof of Commissioning to PMU	The hydro resource is not enough to power the adjacent community
résultat 4 Sensibilisation accrue sur le potentiel SHP et le climat d'investissement	Implementation of a SHP Clearinghouse (facilitation platform) mechanism Implementation of a PR and investment promotion campaign	Non existing Non existing	1 implemented 1 implemented	Facilitation platform operating Campaign Conducted	Campaign channels are not adequate for outreach to relevant stakeholders There is little interest on the initiative

4 Total budget and workplan

Award ID:	XXX	Project ID(s):	XXX
Award Title:	GEF PIMS 4685 Hydro elec Congo Brazza		
Business Unit:	COG10		
Project Title:	Small Hydropower-based Mini-grids for Rural Electrification in Congo-Brazzaville		
PIMS no.	4685		
Implementing Partner (Executing Agency)	ANER		

Components	Responsible party	Source of Funds	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount (USD)	Amount (USD)	Amount (USD)	Amount (USD)	Amount (USD)	Notes
						Year 1	Year 2	Year 3	Year 4	Total	
Component 1- Policy and de-risking instruments for SHP and RE-based mini-grids	UNDP	62000	GEF	71200	International Consultants	40,000	40,000	30,000	20,000	130,000	1
		62000	GEF	71300	Local consultants	40,000	40,000	40,000	30,000	150,000	2
		62000	GEF	71600	Travel	10,000	10,000	10,000	10,000	40,000	3
		62000	GEF	72200	Equipment and Furniture	10,000	10,000	10,000	10,000	40,000	4
		62000	GEF	72100	Contractual Services-Companies	20,000	20,000	10,000	5,000	55,000	5
		62000	GEF	72100	Investment	50,000	150,000	15,000	150,000	365,000	6
		62000	GEF	74200	Audio Visual & Print Prod Costs	5,000	5,000	5,000	5,000	20,000	7
		62000	GEF	75700	Training, workshop, meetings	5,000	5,000	5,000	5,000	20,000	8
		62000	GEF	74500	Miscellaneous	2,500	2,500	2,500	2,500	10,000	9
Total Outcome 1						182,500	282,500	127,500	237,500	830,000	
Component 2- Technology and services supply chain	UNDP	62000	GEF	71200	International Consultants	5,000	10,000	10,000	10,000	35,000	10
		62000	GEF	71300	Local consultants	10,000	10,000	10,000	10,000	40,000	11
		62000	GEF	72100	Contractual Services-Companies	10,000	20,000	20,000	20,000	70,000	12
		62000	GEF	71600	Travel	5,000	10,000	10,000	10,000	35,000	13
		62000	GEF	75700	Training, workshop, meetings	2,000	2,000	2,000	2,000	8,000	14
		62000	GEF	72200	Equipment and Furniture	22,000	50,000	50,000	30,000	152,000	15
		62000	GEF	74500	Miscellaneous	2,500	2,500	2,500	2,500	10,000	16

Components	Responsible party	Source of Funds	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount (USD)	Amount (USD)	Amount (USD)	Amount (USD)	Amount (USD)	Notes
						Year 1	Year 2	Year 3	Year 4	Total	
Total Outcome 2						56,500	104,500	104,500	84,500	350,000	
Component 3- SHP-based mini- grids roll-out	UNDP	62000	GEF	71200	International Consultants	20,000	20,000	30,000	15,000	85,000	17
		62000	GEF	71300	Local consultants	20,000	2,000	20,000	15,000	57,000	18
		62000	GEF	71600	Travel	10,000	15,000	15,000	15,000	55,000	19
		62000	GEF	74200	Audio Visual & Print Prod Costs	5,000	5,000	10,000	10,000	30,000	20
		62000	GEF	72400	Communic & Audio Visual Equip	2,000	3,000	3,000	5,000	13,000	21
		62000	GEF	75700	Training, workshop, meetings	1,000	2,000	3,000	4,000	10,000	22
		62000	GEF	72100	Contractual Services-Companies	30,000	50,000	50,000	50,000	180,000	23
		62000	GEF	74500	Miscellaneous	2,500	2,500	2,500	2,500	10,000	24
Total Outcome 3						90,500	99,500	133,500	116,500	440,000	
Component 4- Public Relations and promoting investment	UNDP	62000	GEF	71200	International Consultants		5,000	5,000	10,000	20,000	25
		62000	GEF	71300	Local consultants	5,000	10,000	15,000	20,000	50,000	26
		62000	GEF	71600	Travel	1,000	3,000	5,000	15,000	24,000	27
		62000	GEF	74200	Audio Visual & Print Prod Costs	2,000	5,000	10,000	15,000	32,000	28
		62000	GEF	72400	Communic & Audio Visual Equip	2,000	3,000	10,000	15,000	30,000	29
		62000	GEF	75700	Training, workshop, meetings	1,000	3,000	5,000	5,000	14,000	30
		62000	GEF	74500	Miscellaneous	2,500	2,500	2,500	2,500	10,000	31
Total Outcome 4						13,500	31,500	52,500	82,500	180,000	
Project Management	UNDP	62000	GEF	71200	International Consultants		12,500		12,500	25,000	32
		62000	GEF	71300	Local consultants	15,000	15,000	15,000	15,000	60,000	33
		62000	GEF	71600	Travel	5,000	10,000	10,000	14,133	39,133	34
		62000	GEF	72200	Equipment & Furniture	5,000	3,000	2,000	2,000	12,000	35
		62000	GEF	74500	Miscellaneous	2,000	2,000	2,000	2,000	8,000	36
Total Project Management						27,000	42,500	29,000	45,633	144,133	
TOTAL Project						356,500	529,000	394,500	484,133	1,944,133	

Budget Notes

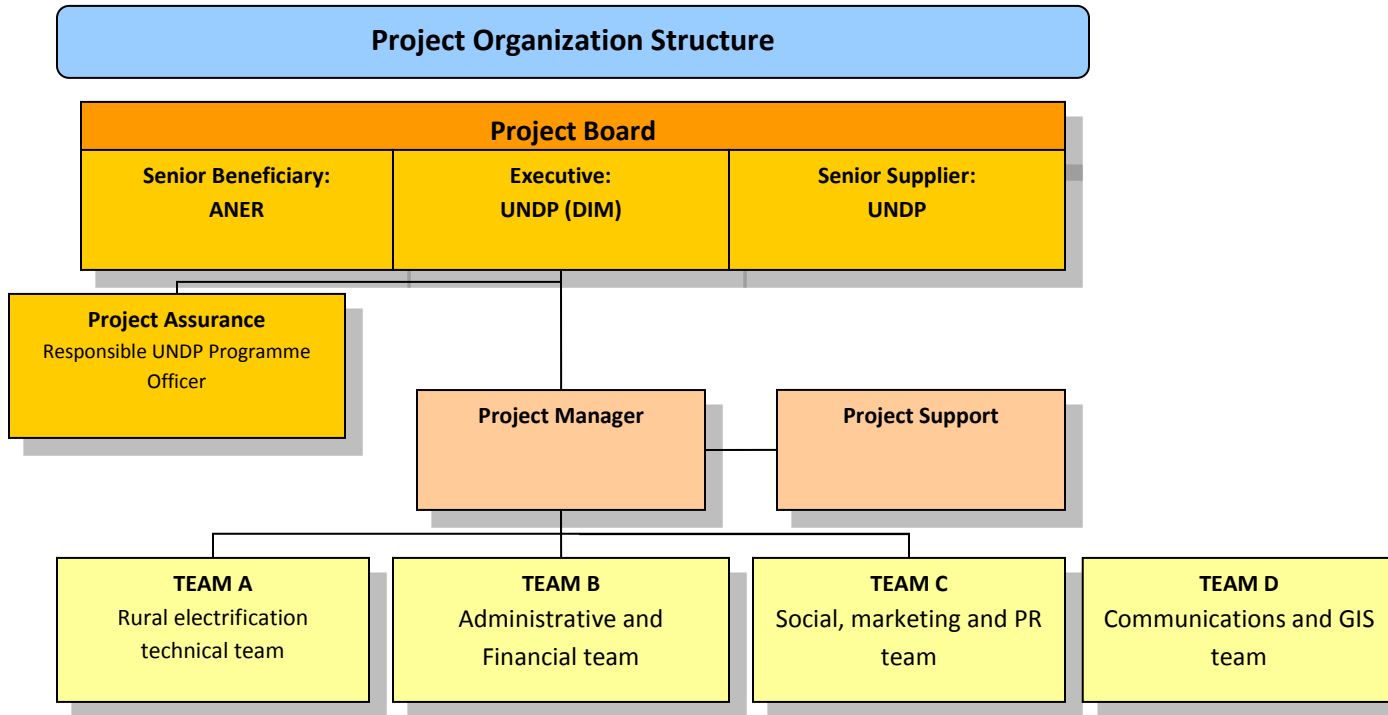
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Summary of Funds:²³

Sources of Cofinancing	Name of Cofinancier	Type of Cofinancing	Year 1 (\$)	Year 2 (\$)	Year 3 (\$)	Year 4 (\$)	Year 5 (\$)	Amount (\$)
GEF Agency	GEF	Grant	356,500	529,000	394,500	484,133		1,944,133.00
National Government	ANER/MMEH	In-kind	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	200,000.00
National Government	Development Fund	Grant	850,000.00	2,550,000.00	4,250,000.00	5,100,000.00	4,250,000.00	17,000,000.00
GEF Agency	UNDP	Grant	100,000.00	100,000.00	100,000.00	100,000.00	100,000.00	500,000.00
Other Multilateral Agency (ies)	World Bank/AfDB	Soft Loan	450,000.00	750,000.00	750,000.00	450,000.00	600,000.00	3,000,000.00
Bilateral Aid Agency (ies)	tbd	Grant	75,000.00	225,000.00	375,000.00	450,000.00	375,000.00	1,500,000.00
Private sector	Private sector	Co-financing	-	-	150,000.00	150,000.00	200,000.00	500,000.00
Total Co-financing			1,903,826.60	4,098,326.60	6,084,826.60	6,706,826.60	5,850,326.60	24,644,133.00

²³Summary table should include all financing of all kinds: GEF financing, cofinancing, cash, in-kind, etc...

5 Management Arrangements



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

Description of each position:

ANER will be the government institution responsible for the implementation of the project and will act as the Implementing Entity/Responsible Partner. UNDP is the Executing Entity/Implementing Partner for the project and accountable to the GEF for the use of funds. The project is a direct implementation modality (DIM) project.

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

Working closely with ANER, the UNDP Country Office (UNDP-CO) will be responsible for: (i) providing project assurance services to government (ii) recruitment of project staff and contracting of consultants and service providers; (iii) overseeing financial expenditures against project budgets approved by the Project Board; and (iv) ensuring that all activities including procurement and financial services are carried out in strict compliance with UNDP/GEF procedures. A UNDP staff member will be assigned with the responsibility for the day-to-day management and control over project finance.

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

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

The final list of the Project Board members will be completed at the outset of project operations and presented in the Inception Report by taking into account the envisaged role²⁴ of different parties in the Board. The project manager will participate as a non-voting member in the Board meetings and will also be responsible for compiling a summary report of the discussions and conclusions of each meeting.

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

At the outset of project operations, a project inception report will be prepared in co-operation with the key stakeholders, local and international expert(s) engaged in leading or supporting the implementation of the project. The inception report will include detailed work plans for each subcomponent (output) of the project at the specific activity level and elaboration of the required resources and stakeholders to be involved for reaching the stated targets. These output specific work plans will provide the main basis for day-to-day management, implementation and monitoring of the progress of the project, complemented

²⁴**Senior Supplier:** individual or group representing the interests of the parties concerned which provide funding for specific cost sharing projects and/or technical expertise to the project. **Senior Beneficiary:** individual or group of individuals representing the interests of those who will ultimately benefit from the project.

by the annual monitoring to be done at the Outcome level by the PIRs. For further details about the project's overall monitoring and evaluation framework, see chapter 6.

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

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

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

The international experiences and lessons learned from facilitating SHP-based microgrids, including those from the other UNDP managed projects in the country and the region have been taken into account in the design of this new project. The activities of the other donors and the foreseen synergies and opportunities for co-operation have been discussed in further detail in chapter 1.7. During implementation, proper care will be taken to have adequate communication and co-ordination mechanisms in place to ensure that areas of common interest can be addressed in a most cost-efficient way.

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

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

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

6 Monitoring Framework and Evaluation

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

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

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

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

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

Quarterly:

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

- Other ATLAS logs can be used to monitor issues, lessons learned etc... The use of these functions is a key indicator in the UNDP Executive Balanced Scorecard.

Annually:

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

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

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

Periodic Monitoring through site visits:

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

Mid-term of project cycle:

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

The relevant GEF Focal Area Tracking Tools will also be completed during the mid-term evaluation cycle.

End of Project:

An independent Final 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 final evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the mid-term evaluation, if any such correction took place). The final evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental benefits/goals. The Terms of Reference for this evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF.

The 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 Center \(ERC\)](#).

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

During the last three months, the project team will prepare the Project Terminal Report. This comprehensive report will 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 through lessons learned. The project will identify, analyze, 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](http://www.thegef.org/gef/sites/thegef.org/files/documents/C.40.08_Branding_the_GEF%20final_0.pdf). Amongst other things, the GEF Guidelines describe when and how the GEF logo needs to be used in project publications, vehicles, supplies and other project equipment. The GEF Guidelines also describe other GEF promotional requirements regarding press releases, press conferences, press visits, visits by Government officials, productions and other promotional items.

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

M& E workplan and budget

Type of M&E activity	Responsible Parties	Budget US\$ <i>Excluding project team staff time</i>	Time frame
Inception Workshop and Report	<ul style="list-style-type: none"> ▪ Project Manager ▪ UNDP CO, UNDP GEF 	Indicative cost: 10,000	Within first two months of project start up
Measurement of Means of Verification of project results.	<ul style="list-style-type: none"> ▪ UNDP GEF RTA/Project Manager will oversee the hiring of specific studies and institutions, and delegate responsibilities to relevant team members. 	To be finalized in Inception Phase and Workshop.	Start, mid and end of project (during evaluation cycle) and annually when required.
Measurement of Means of Verification for Project Progress on <i>output and implementation</i>	<ul style="list-style-type: none"> ▪ Oversight by Project Manager ▪ Project team 	To be determined as part of the Annual Work Plan's preparation.	Annually prior to ARR/PIR and to the definition of annual work plans
ARR/PIR	<ul style="list-style-type: none"> ▪ Project manager and team ▪ UNDP CO ▪ UNDP RTA ▪ UNDP EEG 	None	Annually
Periodic status/ progress reports	<ul style="list-style-type: none"> ▪ Project manager and team 	None	Quarterly
Mid-term Evaluation	<ul style="list-style-type: none"> ▪ Project manager and team ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team) 	Indicative cost: 20,000	At the mid-point of project implementation.
Final Evaluation	<ul style="list-style-type: none"> ▪ Project manager and team, ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team) 	Indicative cost : 20,000	At least three months before the end of project implementation
Project Terminal Report	<ul style="list-style-type: none"> ▪ Project manager and team ▪ UNDP CO ▪ local consultant 	5,000	At least three months before the end of the project
Audit	<ul style="list-style-type: none"> ▪ UNDP CO ▪ Project manager and team 	Indicative cost per year: 3,000	Yearly
Visits to field sites	<ul style="list-style-type: none"> ▪ UNDP CO ▪ UNDP RCU (as appropriate) ▪ Government representatives 	For GEF supported projects, paid from IA fees and operational budget	Yearly
TOTAL indicative COST Excluding project team staff time and UNDP staff and travel expenses		US\$ 100,000 (+/- 5% of total budget)	

7 Legal Context

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

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

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

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

The implementing partner shall:

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

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

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

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

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

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

The implementing partner shall:

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

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

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8 Annexes

8.1 List of Companies authorized in the Electricity Sector

Source : Ministère de l’Energie et de l’Hydraulique (2014)

N°	Name	Area of activity
1	ELECTRA	Services and Works
2	ENCO	Services and Works
3	CAGIDIAX	Services and Works
4	DA HUA CONGO	Services and Works
5	SEREL	Services and Works
6	ISD	Prestation de services et travaux MT/BT
7	TPI	Services and Works in MV/LV
8	TERASCOM	Services and Works in MV/LV
9	STHIC	Services and Works in MV/LV
10	PROCOB	Services and Works in MV/LV
11	RENCO	Services and Works in MV/LV
12	RMT	Services and Works in MV/LV
13	EGET	Services and Works in MV/LV
14	SOREM	Services and Works
15	CMEC	Services and Works
16	SOTRACO	Services and Works
17	SCTA	Services and Works
18	ELCO CONSTRUCTION	Services and Works
19	CEGELEC	Services and Works
20	CHINA GEHOUBA GROUP COMPANY LIMITED CONGO	Services and Works in MV/LV

8.2 Offline Risk Log

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

#	Description	Date identified	Type	Probability & Impact	Countermeasures / Mgt response	Owner	Submitted, updated by	Last Update	Status
1	Climate change is predicted to cause changes and increase variability of Congo's hydrological regime and precipitation patterns (increased precipitation in North and Central areas and decreased precipitation in Southern and littoral regions) which will pose additional challenges and risk to SHP development		Climate	P ²⁵ = 2 I ²⁶ = 4	Results of climate models for Congo basin region will be incorporated in the design and selection of pilot sites. The existing and projected climatic data will be used to ensure that the chosen sites are not highly affected by irregular rain trends and are least vulnerable to projected changes in hydrological regime. In addition, policy recommendations for SHP promotion will include	N/A		N/A	N/A

²⁵Probability from 1 (low) to 5(high)

²⁶Impact from 1 (low) to 5 (high)

				regulations to protect watersheds in order to maintain the necessary vegetation forest cover.				
2	Insufficient quality of locally produced equipment leading to early break-down of SHP systems and dwindling consumer confidence in the technology, untailed technology transfer		Technology	P = 2 I = 4	Component 2 will address this risk. A range of standardized SHP design options, most applicable and relevant to Congo's landscape and hydro potential, will be identified with various rated capacity (e.g. 100 kW, 300 kW, 500 kW, or more) and local manufactures will be supported to deliver turnkey solutions and spare parts in line with standardized design. The project will also build capacities of SHP operators for proper O&M&M services in order to minimize the risks of technology failure and the demand for spare parts	Project Board		
3	Budget constraints in the government, lack of support /interest from potential private co-investors		Financial	P = 2 I = 5	The project is aligned with Government policies and strategies, so the relevance of the project to the Government is clear. Project monitoring and evaluation framework will allow to follow-up financial disbursement closely with project stakeholders. Financial	Project Board		

				risks will be diminished with co-financing letters and having considered co-financers' strategies and interests are aligned with the project. Components 1 and 2 and namely Component 3 will improve the confidence of private investors.				
4	In Congo, oil-producing country, SHP will have to compete with subsidized and locally available diesel alternatives. Without additional incentives, SHP will likely to remain uncompetitive. Besides, widespread poverty and lack of sustainable source of income resulting in low ability to pay for energy supply services	Market	P = 3 I = 5	Introduction of financial viable tariff for SHP-based mini-grids will be a cornerstone instrument of the proposed policy package, aimed specifically at addressing this market risk by leveling the playing field for SHP against other available alternatives. The key challenge and task here is to set up mini-grid tariffs at such level that balance profitability of MHP investment, on one side, with affordability of service for consumers, on the other side.	Project Board			
5	The success of this project will be determined to a large degree by adoption and effective enforcement of the proposed policies. Lack of political support	Policy	P = 1 I = 3	The project's design is fully aligned with the mandate and policy objectives of key national counterparts, which already ensured their buy in and	Project Board			

	may jeopardize the achievement of immediate results and over-all impact.				commitment. Their political support will be further secured via close involvement in project preparation and implementation activities.				
6	Congo is in a very unstable part of the world: although the country itself is fairly stable, a sudden regime change might cause insecurity, negatively impact on the over-all investment climate and cause delays in project implementation.		Political	P = 1 I= 3	The project will build a wide coalition of partners and stakeholders whose interest in SHP promotion will likely to sustain, even in case of regime change. They include local businesses and communities, NGOs and international development agencies.	Project Board			
7	Lack of interest from communities to support the project, inadequate assessment that do not portray/represent communities necessities (misrepresentation), limited technical capacity, project actions/activities are not oriented towards different community cultural contexts.		Social	P = 2 I= 4	Site selection will be open for proposals from local NGOs, local authorities and commercial/productive users, this is expected to increase the buy-in by the communities.	Project Board			
8	Lack of coordination between different stakeholders, lack of leadership from SHP project office, lack of coordination with local community authorities, top-down approach from donor		Organizational	P = 2 I= 2	Project Board will supervise the links with focal points at all stakeholder levels; Other participants can be invited into the Board meetings at the decision of the Board.	Project Board			

	agencies, planning and execution of project lacks of consultation with local communities and civil society.			Community stakeholders will be involved in site selection and project design.				
9	Limited personnel capacity to adequately implementing the project within the PMU, limited involvement in rural areas and actions become office-centered and not on the field.	Operational	P = 3 I = 2	Capacity building and technical assistance will be provided to relevant national agencies, ANER, ARSEL and FDSEL and also private institutions; effective recruitment of resources and periodic evaluation of performance.	Project Board			

Agreements. Any additional agreements, such as cost sharing agreements, project cooperation agreements signed with NGOs²⁷ (where the NGO is designated as the “executing entity”, letters of financial commitments, GEF OFP letter, GEF PIFs and other templates for all project types) should be attached.

8.3 Letters of Co-financing

(Separate files)

²⁷ For GEF projects, the agreement with any NGO pre-selected to be the main contractor should include the rationale for having pre-selected that NGO.

8.4 Terms of Reference

8.4.1 PROJECT BOARD

Duties and responsibilities:

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

The main functions of the Board are:

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

National Focal Point

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

His/her main duties and responsibilities include:

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

Structure and Reimbursement of Costs

To ensure proper coordination and involvement of key stakeholders, the Project Board will be co-chaired by UNDP, and ANER. ANER, as the key governmental agency in charge of energy policies, will ensure that other governmental agencies are duly consulted and involved as per their mandate. The Board may also include representatives of other stakeholders, by ensuring, however, that the Board will remain sufficiently lean to facilitate its effective operation. Other participants can be invited into the Board meetings at the decision of the Board.

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

Meetings

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

8.4.2 PROJECT MANAGEMENT UNIT

Project Manager

Duties and responsibilities:

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

- General coordination, management and supervision of project implementation;

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

Expected Qualifications:

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

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

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

- Good communication skills and competence in handling project's external relations at all levels;
- Fluent/good knowledge of French and English languages; and
- Familiarity and prior experience with UNDP and GEF requirements and procedures are considered as an asset

Administrative Manager

Duties and responsibilities:

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

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

Expected Qualifications:

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

Administrative assistant

Duties and responsibilities

Supporting the project Administrative assistant, including:

- Coordinating logistics and administrative support of project implementation, including administrative management of the project budget, required procurement support, etc.
- Maintaining up to date business and financial documentation, in accordance with UNDP and other project reporting requirements;

- Organizing meetings, minute taking, business correspondence and other communications with the project partners;
- Managing the projects files and supporting the project manager in preparing the required financial and other reports required for monitoring and supervision of the project progress;
- Supporting the project manager in managing contracts, in organizing correspondence and in ensuring effective implementation of the project otherwise.

Expected Qualifications:

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

8.4.3 INTERNATIONAL TECHNICAL BACKSTOPPING CONSULTANCY (TECHNICAL ADVISOR)

Objective of the Consultancy

The International Technical Backstopping Consultancy (TA) will support the PMU during the execution of the project. The aim of the TA is to provide the necessary technical support for the effective design, implementation and validation of the project.

The design phase will include: a quick assessment of the information about existing mini-grids (technical, operational, economic, geographical) and also the sites identified in the hydropower Atlas developed by UNDP; the registry of technology and service providers; the preparation of tender documents for the proposed consultancies and local and international Technical Assistance and installations (of different batches).

The implementation phase will include the provision of support for the commissioning, supervision and monitoring of the installations and their operation; the development and implementation of a capacity building program, and the provision of support for the development of the Component 4 activities.

Finally, the validation phase will include undertaking the appropriate evaluation and validation of the results.

The BC must present experience in similar international, specifically work in French speaking countries, fluency with French and English is a must.

8.5 Stakeholder Involvement Plan

Stakeholders	Expected role and potential areas for co-operation during project implementation
Central government administration and related organisations and companies	
National Agency for Rural Electrification	<ul style="list-style-type: none"> • Coordination of the overall project preparation activities • Lead the formulation of SHP policy framework and its integration with the national strategies and plans for rural electrification • Facilitating investment promotion, support for SHP, and issuance of co-financing letters
National Fund for Power Sector Development	<ul style="list-style-type: none"> • Collaboration on the design and implementation arrangements for OBA scheme
Power Sector Regulatory Agency	<ul style="list-style-type: none"> • Proposal for developing financially viable tariff structure and methodology for SHPs
Ministry of Mines, Energy and Hydraulic	<ul style="list-style-type: none"> • Ensure consistency of the project and ensure the integration of proposed SHP-related policies in the national policy and institutional framework for power sector reform • Identification of pilot sites • Pan activities related to transfer and development of domestic SHP supply chain and O&M&M models
Ministry of Finance	<ul style="list-style-type: none"> • Co funding of the project for equity investment.
Ministry of Environment	<ul style="list-style-type: none"> • Resources assessment for pilot projects • Ensure the Monitoring GHG emission reductions • Investment support and promotion for SHP, including from international climate finance
Local (municipal) administration and related organisations and companies	
Local communities organization²⁸	<ul style="list-style-type: none"> • Identification of pilot candidate sites • Organization and conduct of awareness raising campaigns • Ensure good understanding of the project by direct beneficiaries.

²⁸During project implementation, local communities' role will be even more profound, they will be involved in several stages of pilot project design, preparation, construction and implementation, including via community endorsement of the tariffs that the project will pilot. The involvement of CSOs and local communities will also contribute to an efficient use of energy by the local population and the development of local income generating activities.

Stakeholders	Expected role and potential areas for co-operation during project implementation
Private companies, NGO and investors	
Private sector: mini-grid technology suppliers and SME of SHP mini grid equipment	<ul style="list-style-type: none"> • Technology needs assessment for SHP supply chain • Design of O&M&M models
Private sector: mini-grid operators and service providers	<ul style="list-style-type: none"> • Provide Operation services and tariff collection on a long term basis • Provide part of the equity investment in some of the projects
Local and international finance institutions	<ul style="list-style-type: none"> • Providing loan financing models for pilot projects

Capacity Assessment:*Results of capacity assessments of Implementing Partner (including HACT Micro Assessment)*

8.6 CO₂ equivalent reductions

Following GEF Manual for calculating the Benefits of Renewable Energy Projects, three types of CO₂ emission reductions are identified:

Direct: are those obtained through the SHP roll-out (Component 3). Assuming that a total of 4 MW will be installed as a result of a site-selection process based on selection criteria and a call for candidate sites:

$$CO_{2_direct} = e * I * c$$

- e: Annual energy replaced: Assuming an average capacity factor of 50% = 8.760 MWh/year
- I: Average useful lifetime in years = 20. Since operators will be allocated to projects, eventually with long-term concessions (Output 3.5) and ownership and management models selected (Output 2.2.), a 20 year investment lifetime can be considered.
- c: CO₂ intensity of the marginal technology, diesel generation, at 0,786 tCO₂e/MWh

$$CO_{2Direct} = 17,520 \text{ MWh/y} * 20 \text{ years} * 0.786 \text{ t CO}_2\text{e/MWh} = 275,414 \text{ tons CO}_2 \text{ eq}$$

Direct post-project:The project does not include activities (e.g., a Fund) that would result in direct post-project greenhouse gas emission reductions. The OBA mechanism is considered for the indirect emission reductions.

Indirect: The indirect CO₂ emission reductions are based on the assumption that, thanks to the benefits provided by the “Component 1-Policy and de-risking instruments for SHP and RE-based mini-grids” (OBA), “Component 2-Technology and services supply chain” and “Component 4- Increased awareness about SHP based mini-grids potential and investment climate”, the investment in SHP-based mini-grids will be enhanced and electricity services will be successfully provided.

According to the Manual, the Approach 2a is used, as a Top-down information but with a bottom-up methodology, that is: $CO_{2indirect TD} = CO_2 TM * CF$

It is assumed that the OBA, will enable the construction of more SHP-based minigrids, exploiting the potential identified in the Hydropower Atlas for the selected 17 sites, a total capacity of approximately 44 MW (one single project is 23 MW). Of these, 4 MW will be installed with the Project. The remaining 40 MW are the SHP market identified and selected in the Atlas, the assumption is made that all these MW will be constructed.

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

$$40 \text{ MW} * 8760\text{h} * 50\% * 0.786 \text{ tCO}_2\text{/MWh} = 137,707 \text{ tCO}_2 \text{ eq/y}; \text{ and during the 20 years of lifetime of the investment, } 2,754,140 \text{ tCO}_2 \text{ eq.}$$

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

- **Direct: 275,414 tons CO₂ eq**
- **Indirect: 2,754,140 tCO₂ eq**

8.7 SHP-BASED MINIGRID REFERENCE COSTS CALCULATION

Investment

The costing calculation has a certain degree of uncertainty since initially we do not have feasibility studies of specific sites. We make a potential scenario and reference costing.

The total budget for works has been established as 17 500 000 USD:

- 17 MUSD from the Government
- 500 000 USD from the Private Sector

The budget available would allow the construction of the SHP of different categories. A category will at least have parameters from the generation characteristics and also the village characteristics. The specific cost of the generation decreases with the capacity. We assume that, for pico hydro, the number of connections for each kW of generation are higher (8) because most of them may hamlets with households with low consumption. For Mini and Small we assume that the normalized number of connections is lower (2) because larger villages will have higher loads and some commercial and manufacturing customers. The table summarizes the working hypothesis:

	Project capacity, per site, kW	Connections per site	Number of sites	Total capacity kW	Total Connections	Total Cost per site, USD*	Total Cost per type, USD
Pico-hydro 5kW	5	30	8	40	240	78,466	627,730
Micro hydro 50kW	50	300	8	400	2,400	390,398	3,123,190
Mini hydro 500kW	500	1,000	3	1,500	3,000	215,460	6,646,380
Small hydro 1000 kW	1,000	2,000	2	2,000	4,000	3,538,650	7,077,300
Total	-	-	21	3,940	9,640	-	17,474,600

Assumptions:

1. SHP (Generation Plant) costs
 - a. Specific costs per kW decrease as installed capacity increases.

	Cost USD/kW	Total Plant Cost per site, USD
Pico-hydro 5kW	10,000	50,000
Micro hydro 50kW	4,000	200,000
Mini hydro 500kW	3,000	1,500,000
Small hydro 1000 kW	2,000	2,000,000

2. SHP-Town “MV transmission” costs. In general, the villages will have to be relatively near the generation so the candidate site is cost effective. We assume that some of the larger towns will have a MV line between the hydro plant and the Town:
 - a. According to the Hydropower Atlas the distances between source and town, in the sites selected in the Atlas, range between 0 (when the town is located at the riverbank) and 22 km for the furthest town; the average distance is 4 km.
 - b. The calculations take an average of 2 km in the projects that will be constructed within the scope (some, probably the smaller ones will be closer to the rivers and the bigger ones further). The total cost is calculated based on the assumption of the average value.

Grid costs, 33 kV	51,300	USD/km
Average distance to town	2	km
Total SHP-Town distr. Costs	2,154,600	USD

3. LV Distribution grid and consumer connection costs: Costs of pole distribution, LV lines, indoor installations, meters etc.
 - a. There will be a difference in cost per connection, since small hamlets (pico, micro) may have single -phase distribution, closer distances (less houses) and basic home indoor installations; larger sites (micro, small) may have more scattered population, thus longer distances and also higher energy consumption per connection larger indoor installations, metering etc. We assume that the higher cost of the larger villages it is compensated by economies of scale of many customers in one site and consider an average of 500 USD/new connection.
 - b. The “number of connections per kW capacity” depends on the capacity of the plant; it decreases as capacity increases. The assumption behind is that the larger sites will also have bigger consumers of energy (such as commerce and manufacturing), thus, less number of connections per installed capacity.

	Connections/kW	Connections/project	Unit cost USD/connection
Pico-hydro 5kW	6	30	500
Micro hydro 50kW	6	300	500
Mini hydro 500kW	2	1,000	500
Small hydro 1000 kW	2	2,000	500

4. Total:
 - a. The total Cost is computed as the sum of the 1. SHP, 2. SHP-Town “MV transmission”, and 3. Minigrd distribution costs.

	Total Cost per site, USD*	Total Cost per kW, USD/kW	Total Cost per connection, USD/connection
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Pico-hydro 5kW	78,466	15,693	2,615
Micro hydro 50kW	390,398	7,807	1,301
Mini hydro 500kW	2,215,460	4,430	2,215
Small hydro 1000 kW	3,538,650	3,538	1,769

*SHP-Town costs have been distributed, assuming that the small towns will be close to the SHP and that the bigger towns will have longer lines between SHP-Town.

The estimated outputs would be between 3.5-4 MW and the number of connections between 9,000-9,500 connections.

Revenues and Operation

To be developed: estimated revenues, maintenance and private co-finance in the third batch.