



PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: Full-sized Project

THE GEF TRUST FUND

Submission Date: 1 April 2009

PART I: PROJECT IDENTIFICATION

GEF PROJECT ID: PROJECT DURATION: 48 months

GEF AGENCY PROJECT ID: XX/SIL/09/XXX

COUNTRY: The Republic of Sierra Leone

PROJECT TITLE: Promoting Mini Grids Based on Small Hydropower for Productive Uses in Sierra Leone

GEF AGENCY: UNIDO

OTHER EXECUTING PARTNERS: Ministry of Electricity and Power, Ministry of Lands Planning and Environment.

GEF FOCAL AREA: Climate Change.

GEF-4 STRATEGIC PROGRAM: CC-SP3: Promoting Market Approaches for Renewable Energy

NAME OF PARENT PROGRAM/UMBRELLA PROJECT: GEF Programmatic Approach on Access to Energy in West Africa.

INDICATIVE CALENDAR	
Milestones	Expected Dates
Work Program (for FSP)	June 2009
CEO Endorsement/Approval	October 2010
Agency Approval Date	December 2010
Implementation Start	January 2011
Mid-term Evaluation	January 2013
Project Closing Date	December 2014

A. PROJECT FRAMEWORK

Project Objective: To develop a market based approach, through public private partnerships, for promoting Small Hydro Power (SHP) based mini-grids to stimulate productive capacities in the country.								
Project Components	Type *	Expected Outcomes	Expected Outputs	Indicative GEF Financing		Indicative Co financing		Total (\$)
				(\$)	%	(\$)	%	
1. Institutional capacity development	TA	Institutional capacity strengthened	1.1 Capacity of state agencies strengthened for RE based mini-grids planning and implementation 1.2 Public-Private mechanisms developed for RE based mini-grids 1.3 Mobilization of resources and co-ordination mechanisms strengthened	50,000	33	100,000	67	150,000
2. Demonstration of SHP based mini-grid	TA & INV	Public - private investments and partnerships and stakeholders acceptance of viability of SHP based mini-grid enhanced	2.1 Detailed feasibility report completed at identified SHP site 2.2 Construction of the SHP plant (2 MW) and local mini grid completed 2.3 Management and operation plan developed and adopted	1,368,182	30	3,225,000	70	4,593,182

3. Capacity Building	TA	Local expertise and knowledge enhanced for SHP based mini-grids (installation, operation and maintenance)	3.1 Local agencies and firms fully trained to ensure operation and maintenance of SHP based mini-grids 3.2 Local communities at district and village levels sensitized on the benefit of SHP projects 3.3 Private service providers strengthened with capacity to maintain equipment 3.4 Capacity of financial institutions enhanced in reviewing RE bankable projects	100,000	40	150,000	60	250,000
4. Policy and Regulatory Framework for SHP development	TA	Conducive policy and regulatory framework in place	4.1 National energy policy framework strengthened on SHP systems 4.2 Ongoing government energy programmes incorporate SHP applications for productive uses 4.3 Policy recommendations from international best practices implemented	50,000	40	75,000	60	125,000
5. Project management				150,000	30	350,000	70	500,000
Total project costs				1,718,182	31	3,900,000	69	5,618,182

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

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

Sources of Co-financing	Type of Co-financing	Amount
Project Government Contribution	In-Kind	500,000
GEF Agency, UNIDO	Grant	100,000
Bilateral Aid Agency(ies)	Soft Loan	1,450,000
Multilateral Agency(ies)	Soft Loan	1,850,000
Private Sector	In-kind	
Others	(select)	
Total co-financing		3,900,000

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

	Previous Project Preparation Amount (a)	Project (b)	Total c = a + b	Agency Fee
GEF financing		1,718,182	1,718,182	171,818
Co-financing		3,900,000	3,900,000	
Total		5,618,182	5,618,182	171,818

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

N/A. The project is for a single focal area, single country and single GEF Agency.

PART II: PROJECT JUSTIFICATION

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

The issue: Sierra Leone is one of the poorest economies in the world (per capita income is US \$ 903 only) despite its rich resource endowment. About two-thirds of its population (4 million people) engages in subsistence agriculture, which accounts for 52 percent of the national income. The government is trying to increase food and cash crop production and upgrade small farmer skills. Also, the government is working with several foreign donors to operate integrated rural development and agricultural projects. Mineral extraction and its export in raw form is major source of earning in the country. Industrialization and its associated benefits have so far reached few of the population.

The power sector in general and hydropower in particular is greatly under-developed in Sierra Leone with the majority of the national power generation (about 115 MW) based on diesel generator sets. In rural areas, where the bulk of the country's population is to be found, less than 10 percent of the population has access to electricity. On average, per capita generation capacity is merely 10 W in Sierra Leone whereas the African region's per capita generation is around 125 W. Developing hydropower in the country could both bring electricity to the people as well as trigger the industrialization in the country. The country's ten years of civil war almost completely destroyed the original generation capacity and related infrastructure. Strong efforts, committed partnerships, and investments are needed to increase power generation capacity, minimize transmission losses and improve the coverage rate (off grid, mini grid and / or national grid). The national grid is very limited, being essentially made up of 200 km of lines under construction bringing power from Bum Buna (50 MW) to the capital, Freetown. Most of the rest of the country is unlikely to be reached by the national grid for many years to come. In such a situation, small diesel-based generators are being run in many places, mostly for lighting and sometimes for powering small enterprises. However, these pose technical and operational challenges that the country cannot currently cope with. In addition, the country's income from trade and services is mostly spent on importing fuel, as the country does not have its own fossil fuel resources. The cost of fuel reaching the various scattered generator sets is very high due to poor transport facilities, so that electricity generation becomes very costly. This fuel use is also polluting the environment and contributing to the country's emissions of greenhouse gases. The only viable alternative is to harness country's rich renewable energy sources to establish local mini-grids to augment rural electrification in the country.

With this scenario, decentralised mini-grids based on locally available sources of renewable energy also become the most cost effective option for rural electrification. For instance, where hydropower resources exist, small hydropower based local grids could be established and serve a number of villages or towns. With the further development of other RE-based projects, these could be converted into mini-grids and with further expansion of mini-grids these could be integrated into the national grid. Several studies have shown that although Sierra Leone has huge potential in various renewable sources of energy, small hydro power is the most efficient and readily available renewable energy resource for augmenting rural electrification and national development. The country has a tropical monsoon climate with rivers crisscrossing the country with abundant quantity of water. There are nine main rivers with an estimated potential about 1,200 MW of hydropower.

The Government is very supportive of the development of the small hydropower sector. However, a number of barriers prevent the full development of the hydropower sector:

- **Lack of National capacity to explore small hydropower resources:** The country is coming out of 10 years of conflict and the government infrastructure and machinery are in very poor condition. There is an unclear allocation of responsibility and accountability in the government for hydropower development. The technical and managerial capability of the relevant national

institutions and the coherency among them, for the accelerated development of hydropower resources is poor. In such a situation, the identification, assessment and design of small hydropower projects to stimulate productive capacities become very challenging.

- **Lack of financial resources and confidence / trust in small hydropower investment:** At present, some international organizations and experts are providing technical support for the RE sector's development but there is still a lack of confidence among the financial institutions to invest in this sector. The main reason behind this is doubts about the assured financial returns and security of the investments. At the same time, the financial institutions and local communities have little trust in hydropower technologies and their associated benefits, which is another challenge for the sector's development since small hydropower plants require strong involvement both from the financial institutions and the local communities.
- **Lack of Technical Support Services and Implementation Guidelines:** Technical support services for the implementation of small hydropower plants are inadequate, which will lead to poor performance of any systems put in place. In addition, there is a shortage of capable designers, while local engineers and experts do not have enough experience with such systems. Also, technical standards and business procedures for engineering design, construction, and commercialized operation of systems are not well developed.

The project: The project aims to reduce / address the institutional, technical, knowledge-related and awareness-related barriers to the promotion of a market approach to promote mini-grids powered by small hydropower systems, with the objective of meeting the need for access to electricity in rural areas without increasing the country's dependence on imported fossil fuels. It will do so by:

1. Demonstrating the technical feasibility and commercial viability of mini-grids powered by small hydropower systems: The successful implementation of one pilot mini-grid based on SHP system by trusted partners like UNIDO and GEF will be the key to generating in-country experience to convince both local communities and potential investors that such RE based mini-grids can bring tangible benefits to their communities, and at the same time, can be financially viable. With respect to the former, it will be important to show that the pilot SHP based mini-grid can strengthen the local economy by supporting income-generating activities powered by the electricity produced. With respect to the latter, the pilot mini-grid will be subjected to detailed appraisals to boost the confidence of potential investors. The results of the appraisals and lessons learned will be published and disseminated among local experts, financiers and relevant institutions. Based on the initial field work already done by UNIDO together with the national counterpart ministry, the pilot mini-grid will be located at a potential site near Moyamba where the economic potential to enhance productive capacities of local communities is also very high.

2. Building the necessary national awareness and capacities: Awareness will be raised through the pilot mini-grid itself as well as through other related activities. The process of learning-by-doing will be used in the pilot mini-grid to build local capacity. The publications of lessons learned from the pilot will also be used for awareness-raising and scaling up. It will also be necessary to establish guidelines and build capacities for technical support and services for quality control of small hydropower systems, including design, engineering, operation and maintenance, and project implementation management to ensure the effectiveness of the operation of such SHP systems.

3. Strengthening the national policy and legal framework: The existing policy and regulatory framework will be reviewed and recommendations formulated. The focus will particularly be on strengthening of the policy and regulatory environment required to promote private sector involvement in rural electrification in the country, with the objective of assisting in the development of a market environment for small hydropower projects and related enterprise development for better rural economy and improved livelihood. The necessary institutional capacities will be built in tandem with building the requisite legal and regulatory framework. The lessons learned from the pilot mini-grid will also be input to the policy formulation and scaling up activities.

The sustainability of the pilot SHP mini-grid will be a very important issue. It will not only be a challenge in terms of technical sustainability but even more importantly in terms of financial, economic and management sustainability. All aspects of sustainability of the pilot SHP mini-grid will be considered well in advance. The project will start from a baseline study of the region to monitor progress in the future. Additionally, the project will involve the community from the beginning. The project's financial sustainability will be put on a solid basis, and to achieve this, a sound tariff and management model will be developed. Productive use of the energy from the project will be maximized, and a business model will be developed for enhancing financial sustainability of the project. Due consideration will be paid to the repair, maintenance and inventory of the pilot mini-grid.

For the further replication of the pilot, focused capacity building, strengthening of the manufacturers' base, market linkage and networking assistance, governmental support through policy and programmes / projects in the country, awareness activities through government support or involvement of institutions for scaling up activities will be vital. The project will be managed to start the catalytic effect for rapid replication in other potential sites of the country.

Global environmental benefits: The pilot SHP mini-grid (2 MW) alone will avoid significant amounts of GHG emissions with direct global environmental benefits. A tentative estimate suggests that the global benefits to be delivered by such projects over their life span is reduction of CO₂ at the rate of 0.480 Kg/KWh. These reductions in emissions will be derived from the avoided consumption of diesel fuel

as the source of energy for the planned mini grids. The uptake, by government and private actors, of the model developed with the pilot mini-grid will generate supplementary emission avoidance. In addition to these global benefits, the project will lead to economic and social benefits in the rural areas of Sierra Leone by ensuring that an important share of the electricity produced is used for productive, income-generating activities.

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

The proposed project will build on national priorities, taking into account recommendations made in the Poverty Reduction Strategy Paper (PRSP) adopted by the Government of Sierra Leone in June 2005, as well as in the medium-term energy plan drawn up by the Ministry of Energy and Power to increase rural electrification in the country. The Government of Sierra Leone is putting very high priority on electricity generation in the country, and is promising 40 percent of the total national budget for the power sector's development. The government promises all its support needed to develop relevant projects in the country.

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

The project is consistent with GEF strategic programme 3 in the Climate Change focal area: Promoting Market Approaches for Renewable Energy. It will increase the quantity of electricity generated from economically viable sources of renewable energy and promote adoption of policies promoting renewable energy utilization.

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

The GEF resources requested for the project will be targeted at establishing a market based enabling environment which ultimately will promote investments in renewable energy based mini-grids in rural areas of Sierra Leone. The GEF funding will primarily be used to co-finance the following project activities: (i) commercialized development of renewable mini hydropower based mini-grid; (ii) assistance for reducing technical, policy and capacity barriers; (iii) sustainability of the project through end use / productive use of energy leading better local economy and rural livelihoods; and (iv) technical assistance for creating renewable energy markets and project management.

E. THE COORDINATION WITH OTHER RELATED INITIATIVES:

The Government is encouraging assistance and support from the donor community, financial institutions and INGOs to develop its energy sector. The Government promises all its support needed to develop such projects in the country. Lessons from similar projects that were developed at Bumbuna (50 MW), Guma (2.4 MW) and Bo (4 MW) could contribute to the success of this proposed SHP. Also some new projects and related activities are under discussion, namely developing a small hydropower plant (at Port Loko of 1 MW capacity) under the Lighting Rural Africa Program by UNIDO with the Government of China assistance and Capacity Building on Small Hydropower Projects by UNIDO in collaboration & support of UNDP Sierra Leone. The experience from such projects will be used to make the proposed project most effective and sustainable. There are a few feasibility studies carried by different INGOs namely GTZ-Germany and JICA-Japan that could be of interest during the project preparation. All relevant projects will be reviewed to ensure maximum coordination with them.

F. THE VALUE-ADDED OF GEF INVOLVEMENT IN THE PROJECT:

Without GEF project, the "business as usual" scenario will involve very modest increases in renewable energy based rural electrification, and the country will continue to rely on diesel power gensets to produce electricity in rural and urban areas. Economic development in rural Sierra Leone would continue to be based on fossil fuel energy sources, and GHG emissions would accelerate in line with the level of development. Under this scenario, the renewable energy from the mini hydro resource potential in the country will continue to remain underexploited. In addition, the use of renewable energy resources will remain restricted to niche markets. In particular, renewable energy based mini grids will not be used in rural areas on a large scale to augment rural electrification efforts.

GEF funding will overcome barriers to more widespread use of small hydropower technology and mini-grids, simultaneously establishing a source of sustainable community income by direct participation of the population in the operation and maintenance of the new facilities. GEF assistance will catalyze market based scale up and replication of renewable energy in rural areas by addressing barriers related to capacity building and awareness creation and increased appreciation of the technical feasibility and economic viability of mini hydro technologies, financial mechanisms promoting private sector involvement, etc. These activities will contribute towards GHG emission reduction through displacement of the current use of fossil fuels and economic and social development in rural areas in Sierra Leone. GEF involvement, therefore, adds value in taking the development of mini hydro-based energy services several steps further.

G. RISKS THAT MIGHT PREVENT THE PROJECT OBJECTIVE FROM BEING ACHIEVED, AND RISK MEASURES THAT WILL BE TAKEN:

The following risks are present but could be minimized through appropriate mitigation measures from the initial planning stages itself.

- **Technical risks** – SHP-based local mini-grids are not technically viable for electricity distribution. Rating: Low, since SHP-based mini-grids have been successfully introduced in several countries in the region. Action: Only use mature SHP technologies that have a track record from other projects in the past.
- **Economic risks** – SHP-based mini-grids are not economically viable in rural areas. Rating: Moderate. Action: Focus on renewable energy for productive purposes where the energy generated is used to create value/service for the communities so that they can use the income generated to pay for the electricity received.
- **Market risks** – Increased investments in SHP-based mini-grids do not provide high enough returns. Rating: High. Action: Mobilize part of the investments from development partners which can provide concessionary financing terms and also focus on providing energy for productive uses.
- **Regulatory framework** - Proposed regulatory framework to promote renewable energy for rural electrification has not been enacted. Rating: Moderate. Action: The Government will play a central role in this project and hence the chances of the proposed policy and regulatory framework not being enacted are extremely low.
- **Fall in fossil fuel prices** - The international price of oil may fall to level where fossil fuel power generation will be more cost effective than renewables. Rating: low. Investment in renewable energy should always include assessment of externalities, which will place renewables on a comparative advantage to fossil fuels. The fundamentals of global oil prices indicate that in the long-term the price of oil is expected to grow again.
- **Hydrological and Climate Change risk** - Climate change could change Sierra Leone's hydrological systems sufficiently so as to render SHP projects economically unviable during their lifetime. Rating: High. Action: Keeping in mind that this adverse situation might arise, design/develop the pilot mini-grid with more safety and sustainability factors.

H. THE EXPECTED COST-EFFECTIVENESS OF THE PROJECT:

The cost-effectiveness of the project will be determined during the project preparatory phase using the following steps: (i) making use of the existing GHG inventories as in the Nation, estimate the current emissions from the present levels of fuel consumptions. (ii) Determine the potential mini hydro projects that can be developed by this project and estimate the potential GHG emission reductions and associated costs. Through the proposed project and replication of similar projects at several other sites in the country, will definitely reduce significant GHG emissions, and would make such projects very much cost effective.

I. THE COMPARATIVE ADVANTAGE OF UNIDO:

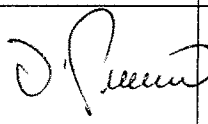
The project fits squarely into the GEF Strategic Program 3: Promoting Market approaches for Renewable Energy. The GEF Council document GEF/C.31/rev.1 gives UNIDO comparative advantage for this Strategic Program under the intervention Type Capacity building/Technical assistance. The project has a strong industrial focus i.e. renewable energy based mini grids for productive purposes, which is UNIDO's overall mandate. UNIDO also has several Regional Centers of Excellence for SHP project development.

PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT AND GEF AGENCY

A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT ON BEHALF OF THE GOVERNMENT:

NAME	POSITION	MINISTRY	DATE (Month, day, year)
Mr. Stephen Cyril James Jusu	Director of Environment	GOVERNMENT OF SIERRA LEONE	February 09, 2009

B. GEF AGENCY CERTIFICATION

This request has been prepared in accordance with GEF policies and procedures and meets the GEF criteria for project identification and preparation.					
Agency Coordinator, Agency name	Signature	Date (Month, day, year)	Project Contact Person	Telephone	Email Address
Mr. Dmitri Piskounov Managing Director UNIDO GEF Focal Point		April 1, 2009	Mr. Rana P. Singh Industrial Dev. Officer Energy & Climate Change Branch, PTC UNIDO	+43-1-26026-Ext. 6419	r.p.singh@unido.org