REQUEST FOR CEO ENDORSEMENT

PROJECT TYPE: FULL-SIZED PROJECT
TYPE OF TRUST FUND: GEF TRUST FUND

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PART I: PROJECT INFORMATION

Project Title: **Sustainable Energy for All: Promoting small-scale hydropower in Bioko and other clean energy solutions for remote islands**			
Country(ies):	Equatorial Guinea	GEF Project ID:[1]	5286
GEF Agency(ies):	UNDP	GEF Agency Project ID:	5143
Other Executing Partner(s):	MPM[2], in cooperation with: MMIE[3] SEGESA[4]	Submission Date: Resubmission Date: Resubmission Date:	12-Feb-2015 21-Oct-2015 8-Dec-2015
GEF Focal Area (s):	Climate change	Project Duration (Months)	60
Name of Parent Program (not applicable):		332,782	332,782

A. FOCAL AREA STRATEGY FRAMEWORK[5]

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Grant Amount ($)	Cofinancing ($)
CCM-3 Promote investment in renewable energy technologies	• Favourable policy and regulatory environment created	• Renewable energy policy and regulations in place	GEFTF	749,192	2,052,381
	• Investments in renewable energy technologies increased; • GHG emissions avoided	• Renewable energy capacity installed; • Electricity and heat produced from renewable resources	GEFTF	2,753,776	37,947,619
		Total project costs		3,502,968	40,000,000

B. PROJECT FRAMEWORK

Project Objective: To create a market for decentralized renewable energy solutions in small island and remote territories						
Project Component	**Grant Type**	**Expected Outcomes**	**Expected Outputs**	**Trust Fund**	**Grant Amount ($)**	**Confirmed Co-financing ($)**
1. Clean energy planning and policies for implementation and scaling up	TA	• Implementation of an approved clean energy enabling framework and mechanisms established for scaling up and replication of investment in on/off-grid	1.1 Integrated resource planning in an approved policy de-risking framework with and RE (renewable energy) action plan 1.2 Accepted and implemented procedures for RE projects assessment and approval (e.g. PPA, FiT) 1.3 Endorsed financial de-risking measures to implement innovative public and private	GEFTF	381,288	600,000

[1] Project ID as assigned by GEFSEC.
[2] Ministry of Fisheries and Environment, *Ministerio de Pescas y Medio Ambiente*
[3] Ministry of Mines, Industry and Energy, *Ministerio de Minas, Industrias y Energía*
[4] *Sociedad de Electricidad de Guinea Ecuatorial*, the national electricity company
[5] Based on GEF's Focal Area Results Framework and LDCF/SCCF Framework

			funding options for recommended small hydropower, solar and wind in small islands			
2. Clean energy technology (hydro) demonstration	INV	• Hydro energy technology and business model demonstrated in Equatorial Guinea's main insular and mainland regions	2.1 Resource assessment and pre-feasibility for small hydro (Ilachi, 12 MW, and other) 2.2 Completed business plan for Ilachi (with detailed feasibility, environmental impact analysis and detailed technical design) 2.3 Completed pilot project demonstrations of rehabilitated (Riaba, Musola, Bicomo; 7.6 MW) and new small-scale hydropower plants	GEFTF	1,895,000	20,995,238
3. Clean energy technology (solar & wind) demonstration	INV	• Other clean energy (solar) technology and business model demonstrated in the insular and remote regions	3.1 Feasibility and business plan for solar (Annobón) and resource and pre-feasibility assessments (solar for remote/rural villages) 3.2 Completed pilot project demonstrations of solar at Annobón (5 MW)	GEFTF	775,372	16,000,000
4. Clean energy knowledge & capacity	TA	• Information and knowledge on sustainable energy solutions widely shared; Clean energy technical, individual and institutional capacity strengthened	4.1 Awareness raised amongst decision-makers in public and private sector 4.2 Information dissemination to general public 4.3 Training programs on RET established and technicians trained 4.4 Project impact assessment and lessons learned reporting 4.5 Monitoring and evaluation		284,500	500,000
			Subtotal		3,336,160	38,095,238
			Project management Cost (PMC)	GEFTF	166,808	1,904,762
			Total project costs		3,502,968	40,000,000

C. SOURCES OF CONFIRMED COFINANCING FOR THE PROJECT BY SOURCE AND BY NAME ($)

Sources of Co-financing	Name of Co-financier (source)	Type of Cofinancing	Cofinancing Amount ($)
Nat. government	MMIE - SEGESA	In-kind	4,645,238
Nat. government	MMIE - SEGESA	Cash	34,254,762
Nat. government	MPM	In-kind	600,000
GEF agency	UNDP	Cash	500,000
Total Co-financing			40,000,000

Note: cash co-financing will be largely linked with the rehabilitation of three existing small hydropower plants at the central Riaba river (4 MW), central Musola river (0.4 MW) and Bicomo (3,2 MW), estimated to cost USD 19 million as well as the construction of a solar-diesel hybrid facility (with 5 MW solar) at Annobón Island (expected to cost USD 15 million)

D. TRUST FUND RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY

Not applicable

F. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

Component	Grant Amount ($)	Cofinancing ($)	Project Total ($)
International Consultants	284,375		284,375
National/Local Consultants	121,000	100,000	221,000

Subcontracts: USD 2,384,500. See Part IV in the UNDP Project Document

G. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT?

No

PART II: PROJECT JUSTIFICATION

A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN OF THE ORIGINAL PIF[6]

The project design is line with the original PIF, but:

- **The first stakeholder workshops (before and during PPG) have recommended a focus on developing the solar and wind potential on remote islands of Annobón and Corisco (apart from the second main focus area of small hydro on Bioko). However, the proposed projects have changed. The proposed solar-diesel hybrid pilot idea at Corisco Island has been shelved for the time being, as the island is planned to be connected at one point in time by submarine cable. Instead of wind-diesel, solar-diesel hybrid systems have been proposed for Annobón Island. In the project wind power potential will have a lower priority in terms of activities supported, limited to some resource assessments only. Regarding small hydro potential, focus will be extended to mainland sites as well;**
- **The wording of the project objective has been slightly adapted accordingly;**
- **The wording of certain outcomes and outputs has been changed, presenting a grouping of outputs into certain categories (INV or TA) as well as incorporating finding of the project preparation (PPG) phase. In this re-shuffled setup, Component 1 aims at strengthening enabling environment (policy, regulation, attracting investment) for market development and scaling up; Component 2 focuses on demonstrating small hydro technology and implementation models; Component 3 on solar and wind technology demonstration; and Component 4 on knowledge sharing and technical capacity strengthening.**

PIF, outcomes and outputs	CEO ER, reformulated outcomes and outputs
1. Clean energy planning and policies • **Effective enforcement of approved clean energy enabling framework in Eq.Guinea**	**1. Clean energy planning and policies for catalysing funding and scaling up** • **Implementation of an approved clean energy enabling framework in Equatorial Guinea; Finance mobilized and mechanisms established for scaling up and replication of investment in on/off-grid**
1.1. Approved policy derisking framework for	**1.1 Approved policy de-risking framework integrated**

[6] The sectionsA.1 –A.7 in Part II corresponds to similar parts in the GEF-approved PIF, but present additional information

integrated resource planning, with targets and milestones; **1.2. Approved and implemented procedures for renewable energy projects and scope of full feasibility assessments**	**resource planning and RE action plan (renewable energy)** **1.2 Accepted and implemented procedures for RE projects assessment and approval (e.g. PPA, FiT)** **1.3 Endorsed financial de-risking measures to implement innovative public and private funding options for recommended small hydropower, solar and wind in small islands**
2. Clean energy technology and business model • **Transformed on/off-grid renewable energy markets in Bioko island for scale-up/replication in the insular regions**	**2. Clean energy technology demonstration (hydro)** • **Hydro energy technology and business plan demonstrated in Equatorial Guinea's main insular region (Bioko)**
2.1 Completed feasibility assessments of technology options for small hydropower, solar and wind in small islands; **2.2 Business development plans for selected small hydropower (4.3 MW in Bioko island) and alternative renewable energy options for small islands (e.g. wind and solar technologies);** **2.3 Completed pilot project demonstrations of small hydropower plants in Equatorial Guinea's main insular region (Riaba, Musola)**	**2.1 Resource assessment and pre-feasibility for small hydro (Ilachi, 12 MW, and other)** **2.2 Completed business plan for Ilachi (with detailed feasibility, environmental impact analysis and detailed technical design)** **2.3 Completed pilot project demonstrations of rehabilitated (Riaba, Musola, Bicomo; 7.6 MW) and new small-scale hydropower plants**
3. Clean energy catalyzed funding • **Clean energy funds mobilized for off-grid developments in insular regions (e.g. Bioko, Annobon, Corisco)**	**3. Clean energy technology demonstration (solar, wind)** • **Clean energy (solar and wind) demonstrated the insular regions**
3.1 Completed and documented scaled-up hydropower (i.e. Bioko) and preliminary solar and wind (e.g. Annobon, Corisco) resource assessments; **3.2 Recommended and endorsed financial derisking measures to implement innovative public and private funding options for planned renewable energy scale-ups;** **3.3 Approved investments in additional 10MW hydropower (Ilachi)**	**3.1 Feasibility and business plan for solar (Annobón) and resource and pre-feasibility assessments (solar for remote/rural villages)** **3.2 Completed pilot project demonstrations of solar at Annobón (5 MW)**
4. Clean energy knowledge & capacity • **Clean energy technical, individual and institutional capacity strengthened**	**4. Clean energy knowledge & capacity** • **Information and knowledge on sustainable energy solutions widely shared; Clean energy technical, individual and institutional capacity strengthened**
4.1. Implemented and ongoing technology-specific peer-to-peer learning and mentoring, fostering capacity building on RETs at SEGESA, ITNHGE and SMEs; **4.2. Documented and disseminated best practices/lessons learned of decentralized electricity solutions nationwide and regionally**	**4.1 Awareness raised amongst decision-makers in public and private sector** **4.2 Information dissemination to the general public** **4.2 Training programs on RET established and technicians trained** **4.3 Project impact assessment; dissemination of best practices and lessons learned;** **4.4 Monitoring and evaluation**

A.1 National strategies and plans

Or reports and assessments under relevant conventions, if applicable, i.e. NAPAS, NAPs, NBSAPs, national communications, TNAs, NCSA, NIPs, PRSPs, NPFE, Biennial Update Reports, etc.

Equatorial Guinea's NAPA (National Adaptation Plan of Action was finalised in November 2013. The country's Initial National Communication (INC) to the UNFCCC is under development, with a key focus on identifying the mitigation options suitable to the country. Its finalization will be informed by international long-term initiatives, such as the global Sustainable Energy for All (SE4ALL) initiative, as well as national mid-term development and energy policy frameworks:

- Horizon 2020: National Economic and Social Development Plan (NESDP),
- National Electrification Plan (NEP).

The project is in line with Equatorial Guinea's goal of provide access to energy to its entire population, while at the same time lead to the avoidance of greenhouse gas emissions, not often the priority of Least Developed Countries (LDCs).

A.2 GEF focal area and/or fund(s) strategies, eligibility criteria and priorities.

The project is in consistency with GEF-5 Climate Change Focal Area Objective 3 (CCM-3) aiming at promoting investments in renewable energy technologies. It presents a program that promotes renewable energy technologies in insular Equatorial Guinea, by means of in an effective policy framework, institutional capacity and demonstration of small hydropower. The importance of access to energy is also confirmed by the country's commitment of its entire STAR allocation under GEF-5 to its first climate change mitigation project.

A.3 The GEF Agency's comparative advantage:

The project is consistent with UNDP's implementing mandate, capacity and presence, as captured in the 2007 GEF Council document on comparative advantages (GEF/C.31/5). Its emphasis of environmental finance for market transformation is in line with UNDP's Strategic Plan 2008-2011/13 followed in over 150 countries worldwide. The project GEF focal area falls under UNDP's Energy and Environment priority area on "Access to sustainable energy services". UNDP's capacity in this area has been recently codified in the UNDP-GEF Profile document and the UNDP-GEF publication on "Transforming On-Grid Renewable Energy Markets". This project is in line with the Signature Programme no. 1 on clean energy (small hydro, wind and solar), with the proposed policy and financial de-risking interventions targeting Equatorial Guinea's fossil fuel dependent island territories.

UNDP has been involved in providing technical assistance for renewable energy development in developing countries; over 2,000 of such projects have been implemented, including but not limited to GEF-funded projects. UNDP works with multiple stakeholders from public and private sectors, technical experts, civil society and grassroots level organizations. The in-country presence of UNDP ensures that the project can be implemented effectively and will be backstopped by a regional network of technical expertise and financial oversight (e.g. Africa, Latin America &the Caribbean), and headquarters in New York (USA). UNDP will provide USD 500,000 as a cash contribution, which represent around 20% of the Country Office (CO) core resources for the 2013-2017 programming cycle at USD 2,600,000.

A.4 The baseline project and the problem that it seeks to address:

1) Energy sector

Fossil fuels and electricity

Equatorial Guinea a small country located in West Central Africa, with an area of 28,000 km^2 and a population of around 720,000. The insular region (in the Gulf of Guinea) consists of the islands of Bioko (with the capital Malabo) and Annobón (a small volcanic island south of the equator). The mainland region, Río Muni, also includes several small offshore islands (such as Corisco).

Since 1995, when significant off shore oil discoveries were made in the Gulf of Guinea, oil has become Equatorial Guinea's most important export. Today, about 75% of export revenues come from crude petroleum exports and 22% from liquefied hydrocarbons. The oil and gas industry accounts of 95% of the Gross Domestic Product. Due to the oil bonanza, Equatorial Guinea has the highest gross national income per capita (USD 17,608) of any other Sub-Saharan country[7].

As of 2013, Equatorial Guinea's proven oil reserves were put at 1.1 billion barrels (204×10^6 m^3); oil production was estimated at 420,000 barrels per day (67,000 m^3/d) in 2005 and 316,000 barrels/d in 2012, of which crude oil accounted for over 90%[8]. The national oil company is GEPetrol, was founded in 2002, under the Ministry of Mines, Industry and Energy (MMIE). Domestic oil demand was around 2,500 barrels per day (400 m^3/d) in 2012. Since the country does not have any refinery capacity, all oil products are imported. The country had proven natural gas reserves estimated in 2013 at 1.3 trillion cubic feet (37×10^9 m^3)[9]. The country's natural gas reserves are located off Bioko Island, which is the site of the nation's capital, Malabo, and mainly in the Zafiro and Alba oil and gas fields. The national gas company is Sonagas. Most of the natural gas is exported as liquefied natural gas (LNG) produced by the national company EG LNG (243 billion cubic feet, 2012). Domestic consumption of natural gas is estimated for 2012 at 57 billion cubic feet (1.65×10^9 m3).

Electricity is provided by the national electricity company SEGESA under MMIE. It operates the country's two small electricity transmission networks, which comprise approximately 80 miles of high voltage lines. The network on the mainland serves the suburban area of Bata. The second distribution system, on Bioko, serves the capital Malabo and connects with the port of Luba (which is Bioko's second biggest town).

By mid-2012, the power generating capacity stood at 50 MW, of which 90% was conventional thermal. Production in 2012 was estimated at 100 GWh, while consumption was placed at 90 GWh. However, poor management and aging equipment has resulted in prolonged power blackouts. As a result, small gasoline and diesel-powered generators are used as backup power sources. The power demand is expected to grow at pace with 4-6% GDP growth forecasted for 2012-2016, and population growth of 3% p.a.[10] unlikely to be met. On Bioko Island, installed power capacity is 154 MW turbo-gas plant, 52 MW of diesel generators and 4.3 MW of small hydropower facilities (at Riaba and Musola)

Renewable energy

The country has significant renewable energy potential, and currently the vast majority of its total installed capacity comes from hydro power plants. The power capacity has improved with the commissioning in October 2012 of the Djibloho hydroelectric plant (120 MW) and generation capacity now stands at 385 MW. Although largely undeveloped, Equatorial Guinea is estimated to have 11,000 MW of hydropower potential, of which 50% is deemed

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7 World Bank, "50 Things You Did Not Know about Africa" (2012); UNDP "Africa Human Development Report" (2012)

8 World Oil; Energy Information, Department of Energy; USA (2012)

9 Oil and Gas Journal; Energy Information, Department of Energy; USA (2012)

10 Economic Intelligence Unit (2012)

economically recoverable[11]. Small scale hydropower has received little attention. For example, in the south of Bioko, the old 3.8 MW hydro plant in the town of Riaba has been operating at times at 2% of capacity due to lack of investment in maintenance and need of refurbishing, despite increasing economic activity from the nearby freeport in Luba

2) Baseline scenario and associated baseline activities

Within the framework of the country's development plan, called Plan Horizon 2020, Equatorial Guinea MMIE's National Electrification Plan is primarily focusing on:

a) Taking advantage of the large hydropower in the mainland, the Djibloho power plant represents the first of a series of long-term planned large-scale hydropower facilities along the Wele River[12] in continental Equatorial Guinea (Río Muni) for which various large-scale, 200-400 MW-size hydropower schemes are planned at an estimated total of 2,000 MW;
b) Increase of power generation capacity on Bioko Island as well as the mainland region by means of adding new plants based on fossil fuels, expanding and upgrading the distribution and transmission network;
c) Rehabilitation of the existing small hydropower plants on Bioko (at Riaba and Musola) and the mainland region (e.g. Bicomo) which is being initiated; and adding new small hydropower capacity as well as development of the solar (and wind) resource (in particular on the remote island of Annobón);
d) Institutional and capacity improvements, including the a) introduction of a new Energy Law and restructuring of the power company SEGESA[13]; and b) technical capacity building of staff in the power sector by establishing a School for Electricity within the National Technological Institute ITNHGE[14].

The next stage would be to upscale grid extension and transmission to further expand electrification to remote rural areas, to link up with the power system of neighbouring countries (CAPP, Central African Power Pool) as well as ultimately a submarine power line interconnecting Bata and Malabo.

The insular regions rely almost 100% on fossil-fuel based electricity. However, given SEGASA's problems with providing reliable power, small hydro has been given more attention lately. Small hydropower development is expected to receive merits after the planned refurbishment of the Riaba (4 MW) and Bicomo (3.2 MW) and of the micro hydro facilities Musola 1 and 2 (totalling 0.4 MW) are finalised. A feasibility study on the development of the hydropower potential of the Ilachi River (10-15 MW) in Bioko is planned. A solar-diesel hybrid system (with 5 MW solar) is planned to be installed at Annobón Island.

GEF finance is sought to support these activities andto create an enabling environment for future investments in renewable energy, addressing a range of barriers exist to the use of solar, wind and small hydropower that are summarised below:

Barrier description	**Baseline situation or action**	**GEF-supported alternative Incremental reasoning**
Regulatory and policy barrier		
Lack of RE strategies and plans for off-grid island and hinterland remote areas: • Energy policy decision-	• Apart from the electrification plan, there is no longer-term RE or off-grid electrification section or separate plan;	*Legal/policy provisions accommodate for smaller scale, decentralized solutions (e.g. small hydro, solar, wind), appropriate for each location and considering sustainable development concerns (e.g. employment*

11 www.mbendi.com (2012); *El Sector Eléctrico en Guinea Ecuatorial* (Proexca, Gobierno de Canarias; 2011)

12 A.k.a Rio Benito or Mbini

13 This would imply slitting up the functions of energy service provider (the new SEGESA) and power grid operator, followed by allowing private capital The new Electric Energy Law would be the juridical instrument that regulates activities in the power sector, including the setting of tariffs

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Barrier description	Baseline situation or action	GEF-supported alternative Incremental reasoning
making processes primarily focus on oil and gas developments, while in the power sector the focus is primarily on larger scale, grid extension and transmission concerns • Subsidized petrochemical products do not reflect the actual cost of fuel-generated electricity, deeming RETs expensive	• On-going large hydro developments, and Initial National Communication to the UNFCCC (in progress), are barely advancing the climate change mitigation agenda.	*generation, rural women).* **Outputs:** 1.1 Approved policy de-risking framework integrated resource planning and RE action plan
• Lack of procurement and licensing processes for (independent) power production in Equatorial Guinea) • Thus, limited scope for RET entrepreneurship and for IPP in general	• The monopolistic context in the power sector with no incentive for small scale electricity generation and distribution leads to a small market for RETs; • Plans of restructuring of SEGESA foresee splitting its functions of grid operator and distributor; next stage would see its privatization and the establishment of an independent regulatory authority for the sector; as well as introducing a more rational power tariff system	1.2 Accepted and implemented procedures for RE projects assessment and approval
Institutional / Technical / Economical:		
Limited institutional capabilities and local skills to embrace RETs: • Limited hydropower, solar or wind energy expertise in Equatorial Guinea's MMIE and MFE; No or limited coverage of climate mitigation concerns within the curriculum of the National Technology Institute ITNHGE • Inexistent technical capacity in the supply side (suppliers, installers, financiers) and limited hydropower maintenance capabilities (incl. administration and lack of accountability over asset integrity)	• Lack of local skills and practical experience with small-scale RETs continues; • Lack of information on the costs and benefits of renewable energy sources and appropriate business models	*Capacity building processes address local individual and institutional technical development needs (e.g. solar PV, hydro), awareness raised on their benefits, and integration of RE in the curricula of ITNHGE. MMIE embraces climate mitigation in the reshuffled SEGESA management.* **Outputs:** 4.1 Awareness raised amongst decision-makers in public and private sector 4.2 Training programs on RET established and technicians trained
Market / informational / financial:		
Lack of awareness and information on the benefits of renewable energy sources in Equatorial Guinea • No knowledge of clean	• National utility (SEGESA) is in the process of rehabilitation of the small hydropower plant at Riaba (3.8 MW) and the micro hydro Musola (2 facilities of 0.5	*Government is informed by techno-economic considerations, as appropriate for smaller scale and higher maintenance hydro plants (e.g. river flow estimates, turbine type, head size), and corresponding environmental*

Barrier description	Baseline situation or action	GEF-supported alternative Incremental reasoning
energy (particularly, solar and wind) resource endowments in Equatorial Guinea; • High upfront costs (augmented by custom duties) remain further impairing the cost of introduction of RETs in a small market (no economics of scale);	MW located in the south of Bioko island), but it is unclear that technical and economic feasibility and environmental considerations are met in the current rehabilitation activities or how can be translated in a feasible business plan for administration, operation and maintenance; • Plans for solar project on Annobón (up to 5 MW) with the American MAECI Solar	*conditions of the south of Bioko island (e.g. aquatic life, riparian flora, dry season)* **Outputs:** 2.1 Resource assessment and pre-feasibility for small hydro (Ilachi, 12 MW, and other) 2.3 Completed pilot project demonstrations of rehabilitated (Riaba, Musola, Bicomo; 7.6 MW) and new small-scale hydropower plants 3.1 Feasibility and business plan for solar (Annobón) and resource and pre-feasibility assessments (solar for remote/rural villages) 3.2 Completed pilot project demonstrations of solar at Annobón (5 MW) 4.3 Project impact assessment; dissemination of best practices and lessons learned 4.4 Monitoring and evaluation
Economic / investment decision		
No economies of scale and scope identified to leverage RE small investments • No consideration of innovative financing mechanisms for RE developments (e.g. feed-in-tariffs, carbon finance); • General poor framework for foreign investment, impairs investments in RE	• Available public funds from oil and gas revenues bankroll nationwide infrastructure developments, including small hydropower, solar, and wind**)**. UNDP and MMIE interface with oil and gas players on social contributions targeting clean energy (e.g. Noble Energy); this may be replicated by other operators that dominate the hydrocarbons market (mainly US companies, such as ExxonMobil, Marathon Oil, Hess; although European and Chinese companies are increasingly active and providing significant credit lines)	*GEF funding of de-risked policy, business and institutional environment, devoted to obtaining further technical information on resource endowments, and assessing other financing options, (e.g. feed-in-tariffs, domestic carbon finance, hydrocarbon sector contributions) that can leverage additional (national and international) renewable energy funds, leads to the promotion of on-grid and decentralized electrification (i.e., remote islands, isolated hinterlands, rooftop), and sustainable development gains (e.g. employment, local content, gender empowerment).* **Outputs:** 2.2 Completed business plan for Ilachi (with detailed feasibility, environmental impact analysis and detailed technical design) 1.3Endorsed financial de-risking measures to implement innovative public and private funding options for recommended small hydropower, solar and wind in small islands; 4.3 Project impact assessment; dissemination of best practices and lessons learned; 4.4 Monitoring and evaluation

A. 5 Incremental /Additional cost reasoning:

Describe the incremental (GEF Trust Fund/NPIF) or additional (LDCF/SCCF) activities requested for GEF/LDCF/SCCF/NPIF financing and the associated global environmental benefits (GEF Trust Fund) or associated adaptation benefits (LDCF/SCCF) to be delivered by the project:

The project will promote a reduced dependence of Equatorial Guinea, particularly its island regions, on fossil fuel-generated electricity, with increased access and consideration of cleaner energy resources (e.g. small scale hydro, solar and wind power). The approach proposed will holistically address the weakness of the country's policy-institutional, market and technology supply frameworks and tackle the root causes of the barriers associated risks (see A.4 and A.6).

1) Project scope and activities

Project goal

To create a market for decentralized renewable energy solutions in small-island and remote territories

Component 1 Clean energy planning and policies for implementation and scaling up

Outcome: • Implementation of an approved clean energy enabling framework and mechanisms established for scaling up and replication of investment in on/off-grid	
Outputs	*Activities*
1.1 Approved policy de-risking framework integrated resource planning and RE action plan (renewable energy)	• Assessment of existing legal and regulatory framework and recommendations • General awareness-raising and project progress discussion seminars; • Formulation of an RE Law and RE action plan (with RE on-grid and off-grid targets, timeframe and budget) that operationalizes the cleaner energy aspects of Equatorial Guinea's national electrification plan[15]
1.2 Accepted and implemented procedures for RE projects assessment and approval (e.g. PPA, FiT)	• Grid integration assessment to manage variability of RE sources, define operational parameters for grid-connected RE plans • Formulation of procedures in line with the planned restructuring of the power sector that will streamline any required procurement, licensing, permitting procedures and other policy de-risking instruments (e.g. PPA) that would strengthen the enabling environment for clean energy investments by non-SEGESA investors • Stakeholder workshops and meetings
1.3 Endorsed financial de-risking measures to implement innovative public and private funding options for recommended small hydropower, solar and wind in small islands	• Review and selection of technology options with socio-economic costs and benefits; list of viable RE investment opportunities[16] • Assessment study on financial issues and options to transfer the risks to interested financiers (e.g. treasury, development banks, bilateral donor partners) and suggested supportive mechanisms for implementation[17]

[15] The RE Strategy and Action Plan will supplement and embed RE in the Electrification Plan and the planned new Electric Energy Law and combine elements of a supportive regulatory framework (entry of independent RE providers; public-private partnerships; feed-in tariffs, tax incentives) with finance instruments (investment regulations; guarantee schemes for RE loans) and non-financial interventions (capacity building, knowledge management, stakeholder involvement and coordination) with RE targets (on-grid, off-grid; technology-wise) and financing plan;

[16] RE investment proposals in this pipeline can be in various phases of completion at the end of the GEF program, i.e. pre-feasibility study, full feasibility and business plan, financial and investment plan. RE options may include off-grid, mini-grid, on-grid as well as various technologies (small hydro, solar, wind, other)

	• Workshop and seminars

Component 2 Clean energy technology (hydro) demonstration

Outcome: • Hydro energy technology and business model demonstrated in Equatorial Guinea's main insular and mainland regions	
Outputs	*Activities*
2.1 Resource assessment and pre-feasibility for small hydro (Ilachi, 12 MW, and other)	• River flow tests (small and mini hydro; Bioko Island) • Necessary technical detail (e.g. minimum river flow, expected rainfall variability, estimated hydropower capacity) to inform the physical specifications of the planned investments (e.g. recommended turbine size and type, adequate rotation speed, grid frequency); • Identification and assessment at other potential sites for small-scale in Eq. Guinea, in particular on Bioko Island
2.2 Completed business plan for Ilachi (with detailed feasibility, environmental impact analysis and detailed technical design)	• Design study and bankable business plan (Ilachi, 12 MW; other) o Full feasibility study with full technical design details (technical specification; equipment lead times) according to climate variability information (annual changes; dry/wet season) and studied socioeconomic issues and environmental impact assessment (e.g. riparian flora, aquatic life) o Estimates of energy production and expected sales (tariff); o Business model (ownership and management structure) and economical/financial feature (financing initial investment and costs of operation and maintenance; insurance premiums, contingencies)
2.3 Completed pilot project demonstrations of rehabilitated (Riaba, Musola, Bicomo; 7.6 MW) and new small-scale hydropower plants	• Technical support and business model advice provided during the rehabilitated plants, operation and maintenance (Riaba, Musola, Bicomo; 7.6 MW) as well commissioning of new plants • Evaluation report, discussed at stakeholder meetings, with recommended action after first period of operation

Component 3 Clean energy technology (solar and wind) demonstration

Outcome: • Other clean energy (solar) technology and business model demonstrated in the insular region	
Outputs	*Activities*
3.1 Feasibility and business plan for solar (Annobón) and resource and pre-feasibility assessments (solar for remote/rural villages)	• Project preparation, solar-diesel Annbón (feasibility, demand and social study, design study, EIA and business plan) • Identification of and resource assessment in other sites, including mainland locations) and analysis of technology options for certain applications (e.g. grid-connected, solar-diesel; rooftop PV, etc.) or target group • Workshops and seminars
3.2 Completed pilot project demonstrations of solar at Annobón (5 MW)	• Targeted technical support in establishing solar-wind hybrid plant (5 MW of solar) on Annobón • Workshop and seminars

[17] E.g. feed-in-tariffs, tax incentives (e.g. RE incentives such as duty-free imports), lending support which would provide investors with more predictable long-term price for renewable energy options, and the consequent revenue, profit and value-added streams;

Component 4 Clean energy knowledge and capacity

Outcome: • Information and knowledge on sustainable energy solutions widely shared; • Clean energy technical, individual and institutional capacity strengthened	
Outputs	*Activities*
4.1 Awareness raised amongst decision-makers in public and private sector[18]	• Awareness events led by MPM and MMIE for various stakeholders • Industry conferences and consultations; Study tours • Assisting project proponents in the identification and design of RE projects and arranging or suggesting sources of financing
4.2 Training programs on RET established and technicians trained	• Setting up training programme of SEGESA & ITNHGE technicians on RETs; • Trainings and workshops carried out for different target individuals (e.g. technicians, contractors, planners) and communities and institutions/NGOs
4.3 Information dissemination and awareness creation of the general public	• Info in press, radio/TV, blogs on project progress and on small RE applications in general
4.4 Project impact assessment and lessons learned reporting	• Support project inception, work planning, impacts and progress reporting; Final project report, incorporating lessons learned and recommended post-project activities • Project site visits and publications
4.5 Monitoring and evaluation	• Mandatory mid-term and final evaluation; audits • Inception workshop and report

2) Innovativeness, sustainability and potential for scaling up

Regarding *innovativeness*, this first-ever GEF-funded climate mitigation project tackles the key sector of Equatorial Guinea's economy. The country's current focus is on increasing hydrocarbons and large-scale power for exportation, but this intervention is expected to prompt a paradigm shift towards smaller-scale investments to boost production for local consumption. Particularly, its focus on fossil-fuel dependent islands will help achieve the government's ambition to provide electricity to all in a sustainable manner, by replacing gas-fired electricity with hydropower.

On *sustainability*, a number of risks may affect the likelihood of continuation of the project's benefits after the project ends. These are listed in the next section A.6 and possible risk mitigation measures are assessed. The project's outputs are designed to implicitly improve the sustainability of renewable energy in Equatorial Guinea. Tariffs will be decided by SEGESA and MMIE in accordance with current regulations. Although the end-user will not cover the LCOE (levelised cost of energy), the basic idea is that tariffs should cover operation and maintenance and part of replacement cost. However, it should be note that the proposed renewable energy generation in terms of LCOE is cheaper than diesel-fired generation (as explained in detail in Annex D of the Project Document.
In practice this means a cross-subsidy from power generated conventionally to finance the initial investment for the new RE technologies, which will be paid back over time by avoided cost of fuel purchase. On repair and maintenance, this will be responsibility for the technical units of SEGESA that also service existing conventional facilities. To ensure that sufficient local capacity is available the project will train SEGESA and MMIE staff as well local experts (consultants, university) in RE technology (hydro, solar, wind) as part of Output 4.3.

Regarding *scaling up*, the expected benefits and awareness raising initiated by the Riaba, Musola and Bicomo rehabilitated plants (7.6 MW) and the demonstration of new small-scale hydro at the Ilachi plant (12 MW) on Bioko

[18] Targeting prospective project developers, financial institutions and public officials and administrators

Island as well as the solar hybrid system (5 MW) at Annob**ó**n will boost the planned 200 MW hydro investments in the mainland and scaling up investments in solar, wind and small hydropower.

The MMIE will ensure an enabling de-risked environment is created that, beyond project closure, will attract foreign/private investment by:

- An approved policy de-risking framework with and RE (renewable energy) action plan that sets targets for RE to be achieved in a certain period; this will give confidence to inevstors regarding government plans and commitment;
- Accepted and implemented procedures for (small-scale) RE projects assessment and approval for independent power producers that want to operate facilities and/or sell to the grid (e.g. PPA, FiT)
- Financial de-risking measures to implement (e.g. incentives such as tax/duty exemptions, tax holidays/reduction; quick permit approval procedures, etc.

The combination of the new policies, the demo projects, and institutional capacities developed in this project will scale-up investments in new renewable energy technologies in an energy market where fossil energy resources are rich.

A.6 Risks,

Including climate change, potential social and environmental risks that might prevent the project objectives from being achieved and measures that address these risks:

Risk	**Level of risk**	**Mitigation action**
1. Climate variability leading to changed rainfall patterns (flooding, drought)	Medium	Hydrological tests and other technical (solar, wind) socioeconomic and environmental assessments will consider patterns of resilience and vulnerability to inform turbine type and size, rotor speed, or location of installations. This data also helps mitigate related investment risks (e.g. insurance premiums, contingency expenses).
2. Hydroelectric generation jeopardizes human and/or ecosystem activity (e.g. water access, reduced flow, aquatic life)	Low	Planned hydropower developments will be of a micro- to small scale (up to 10MW, with much lower impact than large scale facilities), and will adhere to the residual flows recommended by the feasibility studies. This will prevent any possible concentration of pollutants, adequate management of waste, and mitigate potential water borne diseases, per UNDP's social and environmental safeguards.
3. Lack of coordination / conflict amongst various government institutions with a role in joint energy-environmental matters (e.g. electricity licenses, water policy, public works, impact assessments, agriculture)	High	The project will prioritize the integration of support and activities spearheaded by SEGESA and MMIE, with the necessary guidance from other ministries –e.g. MPM (Environment); Agriculture & Forestry; Infrastructure & Public Works; the public sector–e.g. GEPROYECTOS (state company managing all development project contracts), AGENCIA 2020 (agency overseeing the implementation of the national social and economic development plan "Horizonte 2020"). The established monitoring and reporting processes will be the platforms for such integration (e.g. project inception, start-up launch/implementation, steering committee meetings, as well as national and international forums).
4. Crude oil and gas prices drop making gas-fired electricity and generation fuel cheaper	Low	The trend of fuel prices will be regularly monitored during project execution, to ensure its negative impact on planned clean energy investments can be mitigated. There is high probability that fuel prices will continue rising in the short/medium term. The project will promote the progressive phase-out of fuel subsidies.
5. Limited technical expertise available in-country to support climate change project formulation, preparation, start-up, monitoring and evaluation activities.	Medium	UNDP-GEF support will ensure global best practices and lessons learned are shared and disseminated at all project stages, referring to international recruitment/procurement practices, drawing from knowledge networks and technical rosters to engage qualified professionals with expertise in capacity development. The local university and technological institute (UNGE and INTHGE) and professionals from key ministries will be fully engaged to ensure management and technical know-

		how is transferred.
6. RE projects do not generate sufficient energy	Low	The project will support adequate sizing, equipment specifications and supervise installation of the demo projects and thereafter monitor operations and adhere to guarantees provided by the RET suppliers in order to maximize power generation
7. The business environment in Equatorial Guinea remains challenging (limited finance, high cost of imported goods, cumbersome institutional procedures; small size of domestic market. Policy-regulatory framework is not sufficient for private investors	Medium	The government is prioritising the establishment of an efficient system of commercial arbitration as part of its strategy to promote private sector development. Regarding RE, a significant part of the Project will be dedicated to de-risking measures (resource assessment and cost-benefit analysis, strengthening and streamlining regulatory process for RE off-grid and on-grid project development, preparing and executing PPAs, feed-in tariffs) in such a way that terms and conditions are sufficiently attractive for non-government investors, large and small.
8. Insufficient capital made available for RE scale up	Low	This risk will be mitigate through the implementation and monitoring of pilot projects to show both government and private investors that RE projects can be successfully implemented (see 6.) as well as the implementation of de-risking measures (see 7.). This will raise the confidence of institutions to provide capital funding for post-project investments.
9. Lack of policy and regulatory framework for new renewable energy investments	Medium	Part of this is discussed in points 3 (targets for RE) and 7 (attracting private/foreign investment). Often private sectors want to see two matters: 1) a statement on policy target of (grid-connected) RE in the country, as an indication for Government commitment, and 2) procedures for defining FiTs sufficient to attract investors. The project will specifically address these issues in Output 1.1 (Integrated resource planning in an approved policy de-risking framework with and RE (renewable energy) action plan) and 2.2 (Accepted and implemented procedures for RE projects assessment and approval, e.g. PPA, FiT).

A.7 Coordination with other and with relevant GEF financed initiatives

The project will be implemented by MPM with the MMIE and SEGESA, in direct coordination with all activities Equatorial Guinea plans to undertake related to the international "Sustainable Energy for All" (SE4ALL) initiative. The preparation of the White Paper on energy access mainstreaming, renewable energy and energy efficiency for CEMAC (Central African Economic and Monetary Community) and ECCAS (Economic Community of Central Africa), including Equatorial Guinea, is an example of planned project coordination. The project will seek to establish links and exchange of know-how with regional knowledge centres, such as ARPEDAC[19] (which is a non-profit association involved in research and promotion of services and technologies related to energy efficiency and renewable energy in the Economic Community of Central Africa) and the Regional Centre for Small Hydropower in Africa (based in Abuja, Nigeria), as well as with the GEF-funded project "GEF Strategic Program for West Africa: Energy Component".

The MPM recently elaborated Equatorial Guinea's National Adaptation Plan of Action (NAPA), also with UNDP-GEF support. The energy sector figures an adaptation priority, considering water issues of large scale hydropower developments in the mainland region. The project will have the standard management arrangements other projects have, including a project steering committee with representatives from MPM, MMIE and other Ministries, which will ensure coordination within and outside the GEF project portfolio.

[19] Association pour la Recherche et la Promotion de l'Energie Durable en Afrique Centrale, based in Yaoundé, Cameroon. ARPEDAC has proposed a EU-funded project to establish a Centre of Excellence in Renewable Energy& Energy Efficiency in Central Africa (CEREEECA)

B. ADDITIONAL INFORMATION NOT ADDRESSED AT PIF STAGE:

B.1 Stakeholders and project management

Describe how the stakeholders will be engaged in project implementation

1) Project administration

The project will be executed by the Ministry of Fisheries and Environment (MPM), implemented by the Ministry of Mines, Industry and Energy (MMIE), with SEGESA as the Responsible Party. The project implementation is arrangements comprise the following (see Part 5 in the UNDP Project Document for details):

- National Project Director (NPD)
- Project Steering Committee (PSC)
- Project Implementation Unit (PMU)

2) Stakeholder engagement

Type	Examples	Expected roles in the project
Main government partners Donor partners	MPM	Main government partner with mandate over Equatorial Guinea's environment and fisheries policy, responsibility over its implementation, and national interface with the GEF
	MMIE	Key government partner with mandate over Equatorial Guinea's oil, gas and electricity policy, amongst others (e.g. mines, quarries) and responsibility over its implementation
	SEGESA	Key project implementing partner as the single electricity provider in Equatorial Guinea, tasked to undertake the planned investments, and seek financing for new RE projects.
	Other Ministries	Other Ministries will participate in the Project Steering Committee and provide guidance on linkages with small RE and their respective field of action, e.g. agriculture, tourism, infrastructure, trade, economy and finance, industry, etc.
Grant providers and investors	Donors and private investors	The European Union is a potential partner through the ACP-EU Energy Facility. The strong China-Eq. Guinea business relations may lead to additional development finance; and may also involve the engagement of SynoHydro corporation (Chinese hydropower developer). Local and international construction, hydropower and service companies will be expected to support the planned installations and related infrastructure works and service demands.
	NGOs / academia	These include, among others, Friends of Nature and Development of Equatorial Guinea (ANDEGE); the Program for Protection of the Biodiversity of Bioko (BBPP), the National University of Equatorial Guinea (UNGE), and the Council of Research, Science and Technology of Equatorial Guinea (CICTE)

B.2 Socio-economic benefits

Describe the socio-economic to be delivered by the Project at the national and local levels, including consideration of gender dimensions, and how these will support the achievement of global environment benefits (GEF Trust Fund)

Economic

The project reflects commitment to increase the use of small-scale sources of renewable source of energy, namely small hydro, wind and solar, as a pivotal way to meet the climate change challenge. The project will save money on the imports by avoiding the use of imported fossil fuels. Although large part of the equipment will be imported, the local economy will benefit from the market development of electrical and mechanical technology skills that comes with the installation, operation and maintenance of the systems.

Local population

The project is relevant for the local inhabitants, as in the increases reliability in power supply in the areas in which the hydropower technologies will be located (boosting power supply if power from main grid is interrupted) and increases

availability where the grid does not reach (e.g. the island of Annobón) and power is generated by expensive diesel gensets. In addition, there are Pygmy minorities in Equatorial Guinea, locally called "bakola-Bagyeli". There are about 2,000 Pygmies in the country, living in the high forest regions. However, this project is not likely to have an impact on them. Most of them live in very remote parts, even far from villages. However, if it occurs during project implementation that a potential site is nearby their habitats, the project will ensure that their interest and participation are fully taken into account.

Environmental
In addition to economic benefits, the renewable energy technologies offer great potential to avoid CO_2 emissions from direct fossil fuel burning for electricity generation (see next section B.3). The manufacture and production of renewable energy systems does not involve dealing with hazardous or toxic substances and the systems are easy to recycle.

Social benefits and gender
By demonstrating functioning renewable energy technologies, individual citizens are offered a grasp of energy and environmental issues. Gender aspects will be taken into account as part of the social and environmental impact assessments (outputs 2.2 and 3.1). Gender mainstreaming action will be integrated in all stages of a project cycle, including design of interventions, execution, monitoring and evaluation. References to gender will be consistent throughout the project approach, the activities, indicators, and budget. Female experts will be encouraged to participate in the training and other project activities.

B.3 Cost-effectiveness:
Explain cost-effectiveness in the project design

The project would have considerable global environment benefits in terms of GHG emission reduction through, fuel switching by replacing fossil fuels with renewable energy. The GEF contribution of USD 3,502,968 will result in a cumulative emission reduction of 1,781 kilotons of CO_2 from the pilot/demo project in Components 2 and 3:

- Direct:
  - Rehabilitation of the existing small hydropower plants at Riaba, Musola and Bicomo; 7.6 MW);
  - Solar-diesel hybrid systems (on Annobon Island; 5 MW)
  - Small hydropower facility at Ilachi on Bioko Island (12 MW)

This translates into a GEF (direct emissions reductions) abatement cost of USD 2.25 per tonne of CO_2. The following table compares the cost effectiveness of reducing GHG emissions in the proposed project, based on the estimates presented in Annex E (or Annex D of the UNDP Project Document).

	Cumulative GHG reduction ($ktCO_2$)	**Cost-effectiveness (USD/tCO_2)**
Direct emission reductions: ➢ Small hydropower (7.6 MW) ➢ Solar (5 MW) ➢ Small hydropower (12 MW)	 643 123 1,015	
Total direct	1,781	2.25
Indirect emission reductions ➢ Hydro, solar, wind (repl. factor, 4)	7,121	0.56
Total emission reductions (Direct + Indirect)	8,902	0.45

In terms of cost effectiveness of the technologies, the calculations of Annex E give levelised cost of energy (LCOE) of small hydro of USD 0.07-0.10/kWh and USD 0.29/kWh for the solar PV in Annobón, in comparison with USD 0.31/kWh for a 5 MW diesel generator set. From the viewpoint of LCOE, these RE system are competitive, but their

investment cost (USD 2500-3000/kW) is an order of magnitude higher making investment decision-makers prefer diesel generator sets.

C. DESCRIBE THE BUDGETED M &E PLAN:

The project team and the UNDP Office in Equatorial Guinea (supported by the UNDP-GEF Technical Advisor) will be responsible for project monitoring and evaluation conducted in accordance with the established UNDP and GEF procedures. The Project Results Framework provides performance and impact indicators for project implementation along with their corresponding means of verification (see Annex A). The GEF CC Tracking Tool will also be used to monitor progress in reducing GHG emissions. The M&E plan includes: a) inception workshop and report, b) project implementation reviews, quarterly and annual reviews, c) independent mid-term evaluation and final evaluation, d) audits and e) project impact reports. The M&E plan and budget are summarized below, while more details are provided in the UNDP Project Document:

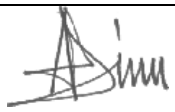
M&E Activity	**Responsible Parties**	**Timeframe**	**Indicative GEF budget (USD) – Output 4.3**
Inception Workshop (IW) and Report	• Execution: PMU, UNDP CO, UNDP GEF	• Immediately following but within four months project start-up	• GEF: 7,000
Measurements of means of verification • Project results • Project progress (output	• Oversight by RTA/PMU and progress monitoring consultant	• Start, mid and end of project (during evaluation cycle) and • Annually prior to APR/PIR and AWPs	• Finalised in Inception phase and part of the annual work plan support and progress reporting (Output 1.3);
Progress reporting: • ARR/PIR • Periodic status and progress reports	• ARR/PIR: PMU; UNDP CO, UNDP RTA	• ARR/PIR by July each year • Other: Quarterly	• GEF: 5,000 (for completion; updating tracking tool)
Project Terminal Report	• Project manager and progress monitoring consultant • UNDP CO	• At least three months before the end of project implementation	• -
Project technical and thematic reports	• PMU, UNDP CO, UNDP RTA	• As requested	• GEF: 4,600
Mid-term evaluation	• PMU, UNDP CO, UNDP RTA, external consultants	• At the midpoint of project implementation	• GEF: 20,900
Final evaluation	• PMU, UNDP CO, UNDP RTA, external consultants	• At least three months before the end of the project	• GEF: 20,000
Audits	• UNDP CO; PMU	• Annual	• GEF: 12,500
Site visits	• UNDP CO, RTA, government representatives	• As appropriate	• GEF: 5,000 • UNDP staff travel to be charged to IA fees
TOTAL indicative COST Excluding project team staff time and UNDP staff and travel expenses			**GEF: USD 75,000** (Output 4.3 in the budget) **Co-fin: USD 40,000**

PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

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

NAME	POSITION	MINISTRY	DATE*(MM/dd/yyyy)*
Mr. Santiago Francisco ENGONGA	Director-General	MINISTRY OF FISHERIES AND THE ENVIRONMENT	**01/08/2013**

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF/LDCF/SCCF/NPIF policies and procedures and meets the GEF/LDCF/SCCF/NPIF criteria for project identification and preparation.					
Agency Coordinator, Agency name	**Signature**	**DATE***(MM/dd/ yyyy)*	**Project Contact Person**	**Telephone**	**Email Address**
Adriana Dinu UNDP – GEF Executive Coordinator		December 8, 2015	**Saliou Toure** Regional Technical Advisor, EITT	+251 912 503 320	saliou.toure@undp.org

ANNEX A: PROJECT RESULTS FRAMEWORK

UNDP Strategic Plan Outcome SP1: Growth and development are inclusive and sustainable, incorporating productive capacities that create employment and livelihoods for the poor and excluded; **SP Output 5.1** Inclusive and sustainable solutions adopted to achieve increased energy efficiency and universal modern energy access (especially off-grid sources of renewable energy (2014-2017)

UNDAF Outcome 4.5: National capacity regarding sustainable management of natural resources and the environment has been strengthened in the areas of water, soils, forest and waste management (2013-2017); **Output 4.5.5**: Sustainable energy technologies and services are available and local management capacities have been strengthened in 4 pilot areas

Country Programme Outcome: The country has a stronger legislative and institutional framework that guarantees sustainable management of the environment, adaptation to climate change and mitigation of its effects (2013-2017)

Applicable GEF Strategic Objective and Program: GEF-5 CCM-3 Promote investment in renewable energy technologies

Applicable GEF Outcome: • Favourable policy and regulatory environment created; • Investments in renewable energy technologies increased; • GHG emissions avoided

Applicable GEF Outcome indicator: a. Extent to which RE policies and regulations are adopted and enforced; b. Volume of investment mobilized; c. Tonnes of CO2 equivalent avoided

	Indicator	Baseline	Target	Source of verification	Assumptions
Project objective: To create a market for decentralized renewable energy solutions in small island and remote territories	A) Lifetime direct CO_2 emission reduction as a result of project-supported demo/pilots B) Indirect GHG reduction due to project's policy, institutional and capacity building and finance mobilization C) Installed capacity of (small-scale) RE and annual power generation D) Annual RE-based MWh electricity from the GEF intervention E) Number of people using RE-based electricity from the GEF intervention	• 0 • 0 • 0 MW[20] • 0 MWh/yr • 0	• Direct and post-project[21]: 1,781 ktCO_2 • Indirect: 7,121 ktCO_2 • 24.6 MW[22] • 101,441 MWh/yr • 72,000	• Project final reports; Project progress reports; • Monitoring reports of the demo/pilot projects (Components 2 and 3) • Official publications (Ministry of Energy) and studies/reports	• Government support for RE will not change; • Government support for implementing de-risking measures and attract IPPs will not change • Economic growth will continue; Macro-economic reforms needed to attract foreign (private) investments will also enable investment in RE • Fossil fuel prices will not sharply fall, while fuel subsidies will be phased out;

[20] Some 15 MW was installed during 1979-1990, but lack of maintenance has left these plant non-operational over time; Riaba, Musola and Bicomo are planned to be rehabilitated;

[21] Emissions from the upgraded Riaba, Musola 1 and 2 and Bicomo small hydropower plants (643 ktCO_2) and newly added capacity (Annobón, solar; 123 ktCO_2 and Ilachi, Bioko; 1,015 ktCO_2

[22] Small hydro: Riaba, 4 MW, Musola I and II: 0.4 MW, Bicomo: 3.2 MW; Solar hybrid on Annobón: 5 MW and (post-project) Ilachi small hydro: 12 MW, with which RE-based electricity would stand at an approximate 10% of the total energy matrix

	Indicator	Baseline	Target	Source of verification	Assumptions
Outcome 1: Implementation of an approved clean energy enabling framework and mechanisms established for scaling up and replication of investment in on/off-grid	F) Number of RE projects proposed for approval (and post-project implementation)	• 0	• 5[23]	• Completed studies and plan (with on-grid and off-grid targets; policy instruments/tariffs; regulations; budget and sources of finance); • Guidebook with rules and procedures for RE projects • Documents on RE projects feasibility and potential sources of finance for RE • Website on RE resources, options and regulations and latest news • Official publications	• Sufficient capacity and willingness to coordinate exists amongst various Government entities; • Government support for RE and for support for implementing de-risking measures and attract IPPs will not change
Outcome 2: Hydro energy technology and business model demonstrated in Equatorial Guinea's main insular and mainland regions	G) Number of small hydropower projects that are operational	• 0[24]	• 3[25]	• Assessment reports for particular locations • Documents on feasibility and design (feasibility, design, financial closure) • Monitoring reports of construction and operations; records of power generation • Project progress reports • Website on RE resources, options and regulations and latest news	• No real change in rainfall patterns; Impacts of small hydropower development does not jeopardize human or ecosystem activity; • Government support for RE will not change; • Adequacy of support in design, installation and operation and maintenance
Outcome 3: Other clean energy (solar and) technology and business model demonstrated in the insular	H) Number of sites assessed for application of solar PV or solar hybrid systems (feasibility) I) Number of small hydropower projects operational	• 0 • 0	• 5 • 1[26]	• Assessment reports for particular locations • Documents on feasibility and design (feasibility, design, financial closure)	• Adequacy of support in design, installation and operation and maintenance

[23] Projects of Indicators I) and K), of which 5 are considered for approval and financing

[24] Existing small-scale hydropower facilities (e.g., Riaba and Musula I & II) are not operational

[25] It is expected that the three hydropower facilities at Riaba, Musola I and II and Bicomo will be rehabilitated and operational (contributing to direct emission reduction)

[26] Solar-diesel hybrid system at Annobón Island (5 MW of solar)

	Indicator	Baseline	Target	Source of verification	Assumptions
and remote regions				• Monitoring reports of construction and operations; records of power generation • Project progress reports	
Outcome 4: Information and knowledge on sustainable energy solutions widely shared; Clean energy technical, individual and institutional capacity strengthened	J) Number of awareness-raising events organised and attendance K) Number of RE-relevant training programmes and attendance L) Number and status of RE info campaign	• 0 • 0 • 0	• 10[27] • 2[28] • 1	• Workshop and seminar proceedings; evaluations by participants • RE training course materials; evaluations by participants • RE info materials designed and published • Monitoring and evaluation reports; Project Final report	• Sufficient expertise exists to plan, execute and monitor projects and staff has willingness to take part in training/capacity strengthening programmes • Sufficient interest and participation by decision-makers in institutions, NGs and private sector

[27] The project should organize at least 10-15 events a year (1 or 2-day workshops), of which 9 event/days for decision-makers

[28] At least one RE course designed and implemented plus targeted 1-day workshops (total of 25 training.days)

ANNEX B: RESPONSES TO PROJECT REVIEWS

(from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

1) Comments from STAP at PIF (May 2013)

- Project acknowledges that the existence of fuel subsidies represents an important risk to future development of RET in the country and suggests to promote progressive phase-out of fuel subsidies. How this will be achieved is not clear in the proposal. Some lessons and recommendations could be learned from this study: Victor, D.G. (2009) The Politics of Fossil-Fuel Subsidies', The Global Subsidies Initiative, Untold Billions: Fossil-fuel Subsidies, Their Impact and the Path to Reform, Geneva: IISD: www.globalsubsidies.org/files/assets/politics_ffs.pdf

  UNDP response:
  Such a phase-out itself is a political decision and, as such, beyond the scope of the direct project intervention. However, in the various studies of the project (assessment, cost-benefit analyses) it can be stressed that introduction of RE technologies is negatively affected by the existence of such subsidies. The Government is currently elaborating a new Law on Electric Energy, which would update the methods of tariff setting.

- The private sector, in the form of the national-owned power utility company, is to provide $39M as a grant, being most of the total project co-funding of $40M. This fits well with GEF strategies but is there any risk in that approach? The wind and solar options seem to be tacked on with no specific details provided other than the two locations named.

  UNDP response:
  This risk is mitigated by the fact that with public sector funding the private sector is more likely to get involved in the project, as confirmed by the signed co-financing letter. One of the project's activities is to look for and establish an enabling environment for other than government financing (development banks, private sector; commercial banks); however, the ultimate aim of the Government as expressed in its national electrification plan is to privatize the utility (SEGESA). Wind (mainly in Annobon) and solar options (nationwide) have an initial focus on the islands (i.e. Annobon, Bioko, Corisco). The project components 2, 3 and 4 tackle the options available for all RE sources, including training, awareness-raising, feasibility assessments for both solar and wind in Annobon island.

- It is not clear from the proposal but it seems the aim is to refurbish the old 4MW plant in Riaba, construct the new 4.2 MW plant at Musola, and then construct the 10MW IIacha plant (Is this on the mainland or on Bioko?). The removal of oil subsidies is essential for the project to succeed. It is not clear whether the rivers are to be dammed or run-of-river hydro plants designed - with differing environmental and land-use impacts. It is most probably run-of river. The new Energy Law will include provisions for the removal of oil subsidies as the Government has already is contemplating their phase-out.

  UNDP response:
  The existing plants (Riaba, 4.0 MW; the two Musola plants, total 0.4 MW and Bicomo, 3.2 MW will be repaired and rehabilitated. The project will support solving any management, operation and maintenance issues. Regarding Ilachi (indeed, on Bioko) the whole hydroelectric project cycle will be supported with TA from resource assessment, feasibility, design to installation and commissioning and looking at management, operation and maintenance issues. The plant will be financed as part of the above-mentioned co-financing. These are all run-of-river schemes.

- Small and micro- hydro is a well understood, mature technology - and hydro plants apparently already exist on the island as well as 33% of power on the mainland. So it is unclear why a "pilot project demonstration" is necessary (Component 2).

  UNDP response:
  The 33% is generated by large (dammed) hydropower schemes on the mainland; electricity does not reach the insular parts (Bioko, Annobón) that basically rely on power generation by fossil fuels. As mentioned, there are two plants, but the fact that these need to be refurbished are indicative of the lack of drive and maintenance up to now. This has created the impression that small hydro 'is not working'. The technology is 'mature', but its application in Guinea is definitely

not. Hence, the need for demonstration, first that the rehabiliated Riaba, Musola and Bicomo plants keep on operating at their maximum power generation capacity, and the new Ilachi scheme will be designed, installed and commissioned satisfactorily.

- Under Component 3, who will conduct the resource assessments?

  UNDP response:
  The services will be contracted to consultants/consultancy firms

- Section 9. The project lifetime of 5 years seems too short for small hydro with many well-maintained plants still operating after 50 years in some places.

  UNDP response:
  We have assumed a lifetime of 20 years.

- Project correctly acknowledges the importance of climate variability and future climate change risks for small hydropower installations. World Bank IEG Assessment "Adapting to Climate Change: Assessing the World Bank Group Experience Phase III" (http://ieg.worldbankgroup.org/content/dam/ieg/climate_change3/cc3_full_eval.pdf) acknowledges that there different factors project proponents should consider when making their hydropower investment climate-resilient such as safety provisions, environmental impacts, profitability and investment decisions, and various design factors. Unfortunately, no operational guidance is available on how to account for climate risks in hydropower investments. STAP envisions that proper climate risk assessment in case of the proposed for demonstrations areas in Equatorial Guinea will be impeded by the lack of historic hydrological cycle data. Project proponents are advised to explore different approaches and lessons learned for the World Bank projects and elsewhere to approach climate risks of project investments in a systemic way.

  UNDP response:
  Looking into issues, such as climate and rainfall variability, local environment impacts, cost-benefit analysis as well as local and social-economic impacts will be integral part of the project's design and feasibility studies (Outputs 2.1 and 2.2). In addition, a grid integration assessment will provide guidance on managing the vulnerability of hydropower infrastructure to the changing climate (Output 1.2). Project implementation will consider the lessons learned and best practices from World Bank interventions.

- GEF's contribution of $3.5 M is to help develop policies to support renewables, undertake feasibility assessments, support 3 pilot projects (Riaba 3.8 MW, Musola 0.2 MW and 0.2 MW), and undertake capacity building. The relationship with the national utility leading the project is not clarified, nor any mention of monitoring and evaluation. What will be the indicators and measures of whether the project is a success or not?

  UNDP response:
  Being the national utility, SEGESA will manage and operate the schemes. M&E will be part of the activities of Outcomes 2 and 3 (monitoring/evaluation of project design, installation and first years of operation). Success is measured by:
  - Number of assessment and feasibility studies done (Ilachi, possibly on Bolo and/or Wele rivers)
  - Satisfactory power generation (at the refurbished schemes Riaba and Musola
  - Advanced stage of development of the small hydroplant on Ilachi River (on Bioko)

- To strengthen regional approach to support for RET and ensure future sustainability of project efforts, STAP is recommending that project proponents consider building links and exchange of know-how with the Centre of Excellence in Renewable Energy and Energy Efficiency in the Central Africa (CEREEECA) and other initiatives being supported by the ARPEDAC (a non-profit association involved in research and promotion of services and technologies related to energy efficiency and renewable energy in the Economic Community of Central Africa, http://www.arpedac.org/).

  UNDP response:
  This suggestion is welcomed and referred to in the main text of the CEO ER document (see Part II, Section A.7)

2) Comments from Council Members on PIF

Germany

Germany approves the following PIF in the work program but asks that the following comments are taken into account: Suggestions for improvement to be made during the drafting of the final project proposal:

- The project framework defines an output "reduction of insurer premiums/ contingencies". It is not defined how this output shall be achieved and it should be clarified if direct support to insurers is excluded.

  UNDP response:
  The project framework has been revised, and components/outcomes re-defined. The former output at PIF level on reduction insurer premiums will be addressed as part of Output 1.3 “Endorsed financial de-risking measures to implement innovative public and private funding option”.

- Further, the indicated total cost of component 2 seems rather high.

  UNDP response:
  A detailed justification of GEF budget is given in Part IV of the UNDP Project Document, while for info and assumption in capital cost of the RE technologies to be employed, more details in Annex D of the ProDoc (= Annex E of the CEO ER).

- The proposal mentions a barrier of limited hydropower expertise at MMIE and MFE which seems strange in view of the country relying to one third on hydropower. In view of the significant hydropower share refurbishment/ repowering could be taken into the list of measures to enhance electricity production.

  UNDP response:
  There is expertise on large-scale hydropower, so technically expertise is available, but running and maintaining a small-scale hydro facility requires additional administrative and technical skills. On solar PV and wind, the expertise available is limited. In any case, bringing the technical (and managerial) expertise up to the level required is the purpose of Output 4.3 (see CEO ER);

- Paragraph 11 describes that the Chinese SynoHydro Corporation might invest in hydropower activities together with government's oil and gas revenues. Clarification is sought about how oil and gas revenues are assigned either to the SynoHydro Corporation or to the GEF funded activities, respectively in how far replication can be achieved.

  UNDP response:
  So far, the Government will be prime mover in the initial small-scale RE activities proposed in this Project. One can indeed say that the Government’s oil and gas revenues are used for this. Similarly to the larger-scale hydro (and conventional power) projects, foreign investors might be attracted, provided that the enabling framework appears sufficiently attractive. The Project will strengthen this framework by the capacity building activities of Outputs 1.1 and 1.2. At Project’s end there will be a portfolio of RE project and investment opportunities (to be identified as part of Outputs 1.3, 2.3 and 3.1 (see CEO ER). Given the amount of Chinese investment in the country, attracting companies such as SynoHydro Corp. might veryu well be possible.

United States

- We are concerned that the mitigation measures for the risks mentioned are not strong enough. The lack of policy and regulatory structure for small scale renewable energy coupled with the high risk of conflict among various government institutions is worrying.

  UNDP response:
  The project will assists in the “implementation of an approved clean energy enabling framework”. Often private sectors want to see two matters: 1) a statement on policy target of (grid-connected) RE in the country, as an indication for Government

commitment, and 2) procedures for defining FiTs sufficient to attract investors. The project will specifically address these issues in Output 1.1 (Integrated resource planning in an approved policy de-risking framework with and RE (renewable energy) action plan) and 2.2 (Accepted and implemented procedures for RE projects assessment and approval, e.g. PPA, FiT).

- The project could benefit from an explanation of the relative costs and benefits of small scale hydropower compared to other renewable energy options, especially given the possibility of climate change affecting rainfall patterns and river flow (reduced rainfall/river flow will have a proportionally larger effect on small hydropower projects as compared to large hydropower projects).

  UNDP response:
  A quantification of cost of renewable energy is given in Annex D of the project document. In general, various options are proposed, according to estimates of best resource availability at specific locations, hence the choice for solar and wind on Annobón and small-scale hydro on Bioko island. The resource estimates are based on general available data and include resource variability. To address uncertainty in variability (as normally occurs between seasons and possible variability superposed by cimate change) will be subject of detailed resources assessments that are proposed as part of Output 2.1)

- The project would also be strengthened by including public participation, especially participation by any local civil society organizations that could provide input or help to implement these projects.

  UNDP response:
  The project is relevant for the local inhabitants, as in the increases reliability in power supply in the areas in which the hydropower technologies will be located (boosting power supply if power from main grid is interrupted) and increases availability where the grid does not reach (e.g. the island of Annobón) and power is generated by expensive diesel gensets. In the feasibility assessment and planning if these project the active participation of the local NGOs will be sought to ensure that the practical implementation and construction benefits thye local populace (e.g. by avoiding environmental consequenmces; creating local employment (during and construction as well as training of locals for operation).

- The project mentions fuel subsidies and a plan to phase them out, but it is not clearly explained how this would happen.

  UNDP response:
  the country has no petroleum refinery. It imports all of its refined petroleum products from Europe, which are sold at subsidised prices set by the government, a practice not uncommon in oil-exporting countries. However, oil production will decline over time, while the power grid system needs expansion and significant upgrading. To be able to generate sufficient finance for the energy sector, the Government will decrease energy subvention over time within the framework of a newly proposed Law of Energy and the Horizon 2020 plan.

- The United States believes the goal of sustainable energy development is beneficial in Equatorial Guinea. However, the United States, in light of its policies for certain development projects, abstains from participating in the decision.

  UNDP response:
  We understand and appreciate the US position.

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS[29]

A. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES FINANCING STATUS IN THE TABLE BELOW:

PPG Grant Approved at PIF: USD 150,000			
Project Preparation Activities Implemented	***GEF/LDCF/SCCF/NPIF Amount ($)***		
	Budgeted Amount	***Amount Spent To date***	***Amount Committed***
Technical review (Baseline analysis of the regulatory framework, policy, technology and market)	30,000	30,000	0
Project design and project document preparation including institutional arrangements, monitoring and evaluation	90,000	90,000	0
Financial planning and co-financing investments (Stake holder analysis and capacity needs assessment, co-financing commitment letters)	20,000	18,000	2,000
Stakeholders consultation and validation workshops	10,000	10,000	0
Total	**150,000**	**148,000**	**2,000**

The PPG phase of the project achieved its main outcome of finalizing the Full-Size Project documentation for CEO endorsement submission to GEF

[29] If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue undertaking the activities up to one year of project start. No later than one year from start of project implementation, Agencies should report this table to the GEF Secretariat on the completion of PPG activities and the amount spent for the activities.

ANNEX D: UNDP PROJECT DOCUMENT

See separate file

ANNEX E: ENERGY SAVINGS AND EMISSION REDUCTION CALCULATIONS

RE investments, associated with Components 2 and 3

A number of RE project activities have already been identified by the Government and have been assessed during the PPG phase (see the report *Informe Técnico sobre proyectos de pequeñas centrales hidroeléctricas, eólicas y solares).* The GEF project will provide technical assistance to assist with the assessment/identification, design, installation and setting up operation, maintenance and management (OM&M) schemes. The Government has committed to provide the investment funds.

Small-scale hydropower

Rehabilitation Musola, Riaba and Bicomo
The mini hydropower facility of Musola I and II is planned to undergo a complete overhaul, including repairing damaged civil works, cleaning up the intake, canal and forebay of debris and silt particles and repairing the penstock, as well as providing repair and maintenance to the electromechanical equipment (turbines, generator, transformer). This will include carrying out a set of test and trial runs, obtaining the necessary spare parts and equipment as well as identifying, selection and training of the plant operators. The activities have started with cleaning up and repairing the civil works part. Similar type of overhaul and maintenance activities are planned for Riaba and a 33 kV transformer and transmission line is needed to connect the plant to the nearby town of Riaba. The nominal capacities are 3.8 MW (Riaba) with an estimated capacity factor of about 40% and 0.5 MW (Musola) with an estimated capacity factor of 55%, if fully functioning. On the mainland region, the existing small hydropower facility at Bicomo (3.2 MW) will be made operational in order to function again at maximum capacity with similar repair interventions as described above.

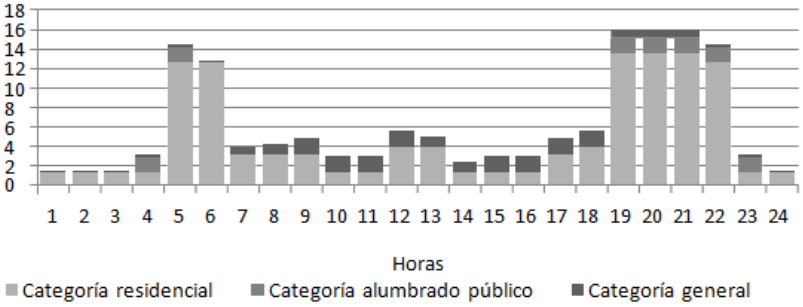
Proposed small hydropower facility, Ilachi River
As one of the two new pilot projects, TA will be provided for the assessment of the hydro-energy potential of Ilachi River (on South Bioko), design, feasibility and social-environmental impact assessment and subsequent procurement of equipment and installation. Part of these technical assistance cost will be covered by the GEF grant, while the remainder and cost of equipment is part of the co-financing. A first estimate of the plant's gross power production follows from rho*Q*g*h = 14 MW, based on the height (h) = 200 metres and a river flow of at least 7 m^3/second. Depending on the season (rainy or dry), gross power availability could be up to 18 MW. Conservatively, 12 MW is assumed for the pilot project calculations here, assuming the employment of two Pelton turbine groups of 6 MW each.

Annobón

Solar-diesel hybrid system

The population of Annobon is about 5,000; other power demand categories are public lighting (400 lighting points) and services (radio station, airstrip, clinic, and school). Demand could be supplied by a diesel-solar hybrid system, consisting of a solar PV facility (5 MW capacity), supplemented by a 10 MW diesel generator.

Average daily irradiation on Annobón is 5.85-6.2 kWh/m2/yr, thus a 1 MW system could yield 4215-4515 kWh/day (capacity factor of 18%). A 5 MW solar project has been proposed by MAECI Solar (United States). A least 10 local residents will be trained so that they can maintain the installation in the future.



Power demand (MW) distribution, Annobon

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Wind-diesel hybrid system

Originally, the *Informe Técnico* of the PPG phase actually envisages a 10 MW wind system, instead of a solar facility. However, the authorities have decided to go ahead with the MAECI 5 MW solar facility. During project implementation, it is suggested to investigate the need for and feasibility of an additional 5 MW wind park in Annobón that could produce about 17.7-19.7 GWh annually, depending on the location of the facility. Assuming 15% of losses (electric; periods of non-availability), this would imply additional annual power production of at least 15 GWh per year. Being a suggestion only, this wind option has not been taken into account into the GHG emission reduction calculations.

Direct and post-project direct emission reduction

There direct emission reduction has been calculated following investments will take place during the proposed 5-year duration of the UNDP/GEF 'Sustainable Energy for All' project:

- Direct (12.6 MW):
  - Rehabilitation of the existing small hydropower plants at Riaba, Musola and Bicomo; 7.6 MW);
  - Solar-diesel hybrid systems (on Annobon Island; 5 MW)
  - Small hydropower facility at Ilachi on Bioko Island (12 MW)

The estimated initial investment needed for the 12.6 MW would be around USD 34 million, while finance for Ilachi would be sourced and decided upon, depending on the feasibility and design studies. The Government has already committed to at least USD 37 million of co-financing (see co-financing letter).

This calculated as indicated in the next table. The baseline technology options is diesel generators, not only on Annobón island, but also on the main island of Bioko, given the problems with reliability and availability of power in the main grid. Thus, the energy generated by small-scale RE systems (hydro and solar) is replacing the equivalent of diesel-based energy. The total cumulative emission reduction over the installations' lifetime of 20 years is an estimated 1,781 kilotons of CO_2 (direct).

Assumptions				
General				
Discount rate	11%			
Exchange rate	USD =480 FCFA			
Fuels				
Diesel	34.9 MJ/litre			
Emission factor	2.8 $kgCO_2$/litre			
Price	1.00 USD/litre			
RE technology costs				
Initial investment cost	2500	3000	2850	USD/kW
- Development cost (feasibility, design)	15%	10%	15%	
O&M	3%	1.00%	4%	
New RE projects	**Hydro**	**Solar**	**Hydro**	
	Riaba, Musola Bicomo	Annobón	Ilachi	
Base data				
Size	**7.6**	**5**	**12**	MW
Lifetime	20	20	20	yrs
Load factor	55%	16%	55%	
Power production	36,617	7,008	57,816	MWhe/yr
Investment -initial	19,000,000	15,000,000	34,200,000	USD
Costs				
Capital cost (annualised)	2,385,937	1,883,635	4,294,687	USD/yr
Annual O&M cost	71,578	150,000	1,368,000	USD/yr
Unit cost of generation	0.067	0.290	0.098	USD/kWh
Benefits				
Avoided diesel consumption	11,109,092	2,126,142	17,540,671	litres/yr
Avoided costs of diesel generation	11,475,979	2,196,360	18,119,966	USD/yr
Direct GHG				
Emission reduction	32,133	6,150	50,736	tCO_2/yr
Cumulative emission reduction	642,655	122,996	1,014,718	tCO_2

	Project - direct	**Post-project**	
Needed project investment	34,000,000	34,200,000	USD
Total cumulative GHG	765,651	1,014,718	tCO2
Net investment (minus GEF support)	32,975,000	33,105,000	

The 'GEF support' is detailed below. The project will provide some limited support by means of technical assistance and advice for the identification, assessment, procurement and installation of associated pilot/demo projects (Riaba, Musola, Bicomo, Annobón). This is summarised below:

GEF project development support (INV components,2 and 3) *(subcontracts, equipment)*		**Develop. cost (USD)**	**GEF contribution**	
			GEF (USD)	**%**
Small hydro				
TA support O,M&M Riaba, Musola	Output 2.3	700,000	60,000	
Resource assessment, Ilachi	Output 2.1	400,000	200,000	
Ilachi TA support: feasibility, design, install and operate	Output 2.2	4,730,000	895,000	
TA support installation & operation, Ilachi	Output 2.3		60,000	
Resource assessment, other hydro	Output 2.1	150,000	150,000	
		5,980,000	*1,365,000*	23%
Solar and wind				
Resource assessment, Corisco/Annobón/other	Output 3.1	320,000	160,000	
Solar and wind (Corisco/Annobón), feasibility, design, install &operate	Output 3.2	1,940,000	905,000	
TA support installation & operation	Output 3.3		120,000	
		2,260,000	*1,065,000*	47%
Total		**8,240,000**	**2,430,000**	*29%*

Out of the GEF support of USD 2,430,000, the amount of USD 2,160,000 is in the form of subcontracts and USD 270,000 for equipment (e.g. measurements, etc).

The cost per unit of energy generated (USD/kWh) of small-scale hydropower and even solar-PV compares favourably with the cost of diesel generation, as indicated in the table below:

Base data			
Life		12	yrs
Size		5.0	MW
Investment cost		1,100,000	USD
Load factor		55%	
Electricity production		24,090	MWh/yr
Generator efficiency		34%	
Diesel consumption		7,308,613	litre
Price of diesel		1.000	USD/litre
Costs			
Capital cost (annualised)		169,430	USD
Diesel cost		7,308,613	USD
O&M	2.00%	55,000	
Overhaul cost (3 yrs)	5%	16,943	
Total cost		7,549,986	USD
Unit cost of generation		0.313	USD/kWh

Indirect emission reduction

The GEF manual for guidance on GHG emission reduction[30] suggests two approaches to estimate the longer-term of the project's technical assistance and capacity building efforts, namely a bottom-up (BU) and top-down approach. Indirect emissions are mainly based by applying a replication factor of four. We think a factor of 'four' is justified given the novelty of the GEF initiative that, if successful, will have great potential to unleash the RE potential in Equatorial Guinea. Thus, the indirect emission reduction can calculated as follows:

CO_2 indirect BU = CO_2 direct * RF, where

CO_2 direct = estimate for total direct and post-direct emission reductions

RF = replication factor

CO_2 indirect BU = 1,780 * 4 = 7,121 ktCO_2

[30] GEF/C.33/Inf.18 *Manual for Calculating GHG Benefits of GEF Projects: Energy Efficiency and Renewable Energy Projects* (2008)