Global Environment Facility

GEF

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September 2, 2009

Dear Council Member:

I am writing to notify you that we have today posted on the GEF's website at www.TheGEF.org , a medium-sized project proposal from IADB entitled ***Bahamas: Promoting Sustainable Energy***, to be funded under the GEF Trust Fund (GEFTF).

The general objective of the this project is to promote and support the development and implementation of sustainable energy sources in the Bahamas providing alternatives to reduce dependency on imported fossil fuels.

The project proposal is being posted for your review. We would welcome any comments you may wish to provide by September 16, 2009, in accordance with the new procedures approved by the Council. You may send your comments to gcoordination@TheGEF.org.

If you do not have access to the Web, you may request the local field office of the World Bank or UNDP to download the document for you. Alternatively, you may request a copy of the document from the Secretariat. If you make such a request, please confirm for us your current mailing address.

Sincerely,

M Barbut

Attachment: Project documents

REQUEST FOR CEO ENDORSEMENT/APPROVAL

PROJECT TYPE: MSP
THE GEF TRUST FUND

Submission Date: July 31, 2009

PART I: PROJECT INFORMATION

GEFSEC PROJECT ID: 3875
GEF AGENCY PROJECT ID: BH-X1001
COUNTRY(IES): The Bahamas
PROJECT TITLE: Implementing Sustainable Energy Projects in the Bahamas
GEF AGENCY(IES): IADB
OTHER EXECUTING PARTNER(S): Ministry of the Environment of The Bahamas
GEF FOCAL AREA(s): Climate Change
GEF-4 STRATEGIC PROGRAM(s): SP1 and SP3
NAME OF PARENT PROGRAM/UMBRELLA PROJECT: N/A

Expected Calendar (mm/dd/yy)	
Milestones	**Dates**
Work Program (for FSPs only)	N/A
Agency Approval date	Aug-09
Implementation Start	Jan- 10
Mid-term Evaluation (if planned)	N/A
Project Closing Date	Aug – 2011

A. PROJECT FRAMEWORK

Project Objective:

The general objective of the this project is to promote and support the development and implementation of sustainable energy sources in the Bahamas providing alternatives to reduce dependency on imported fossil fuels. The specific objectives of this project are: (i) provide technical assistance to the Government of the Bahamas (GoBH) to achieve energy efficiency (EE) in public buildings, the residential sector and commercial sectors, and to implement demonstration projects, in particular the phase-out of incandescent lights by replacing them with Compact Fluorescent Lamps (CFLs) and installation of Solar Water Heater (SWH) systems at the residential level; (ii) explore alternatives for renewable energy (RE), and implement pilot projects in RE, in particular a demonstration project for household photovoltaic (PV) systems connected to the grid using net metering devices; (iii) strengthen the energy sector in Bahamas; (iv) support the GoBH with a review of energy legislation, regulatory and policy issues to promote sustainable energy as well as institutional strengthening in the areas EE, RE and WE; and (v) dissemination of findings. GEF resources will be used to finance two pilot/demonstration projects one in RE consisting of the installation of solar photovoltaic generators on buildings (PVB) using net metering devices as well as an EE program via the installation of solar water heaters (SWH) in representative parts of the Bahamas.

Project Components	**Indicate whether Investment, TA, or STA[2]**	**Expected Outcomes**	**Expected Outputs**	**GEF Financing[1]**		**Co-Financing[1]**		**Total ($)** c=a+ b
				US$ (000) a	%	US$ (000) b	%	
Component 1				488	32%	1057	68%	1,545
EE for public buildings, commercial and residential sector with the implementation of demonstration projects in EE, in particular the replacement of incandescent lights with CFLs and	TA	Potential for EE is identified by sector.	- Assessment of energy uses and electricity consumption patterns -Standardised energy audit protocol and procedures, - Energy audits and cost	57	9%	612[1]	91%	669

[1] [1] Includes US$147,000 end user co-financing for installation of SWH systems

installation of SWH systems at the residential level			assessment of new EE equipment -EE awareness campaign is implemented Financial and administrative model for SWH systems program is implemented and tested - Training programs for 10 SWH plumbers and contractors implemented.					
	Inv	EE savings are demonstrated via the implementation of a pilot project to replace incandescent lights with CFLs	-Approximately 150,000 light bulbs are replaced -Estimated energy savings are 11,333 MWh/year -Reduced CO2 emissions are 120,586 tCO2/year		0%	445	100%	445
	Inv	EE is demonstrated via the implementation of a pilot project to install SWH systems in households	-Approx. 67 SWH of 2.5 m^2 and 67 SWH of 4 m^2 installed. -Estimated energy savings are 295.5 MWh/year Reduced CO2 emissions are 17,965 tCO2/year -Operational data from pilot sites is available for large replication	431	100%	0	0%	431
Component 2				480	44%	616	56%	1096
Assessment of the RE potential, cost and viable options to include RE in the energy matrix with the implementation of	TA	Potential for RE is identified Cost and technical feasibility of different RE	- Financial and operational assessment of BEC is completed, including	90	15%	616[2]	85%	726

[2] Includes US$163,000 end user co-financing for installation of PV systems

a demonstration project in RE – household PV systems using net metering devices		technologies are identified. Action plan to promote RE is prepared.	technical and non-technical electricity losses in transmission and distribution lines. -RE potential and best RE options are identified. -Action plan to include RE in the energy mix, including preparation of RE policy, in place - Financial and administrative model for grid-connected PV systems program is implemented and tested - Training programs for 10 PV electricians and contractors and BEC personnel is implemented.					
	Inv	RE potential is demonstrated via the implementation of a pilot project to install PV systems connected to the grid	-Up to 65 kWp in approx. 26 PV plants are installed. Estimated energy savings are 113 MWh/year Reduced CO2 emissions are 8,589tCO2/year -Operational data for pilot sites is available for large scale replication	390	100%	0	0%	390
Component 3 Strengthening the Energy Sector in Bahamas	TA	Capacity to assess financial and operational aspects of the energy sector including uses of RE is built	-RE alternatives are included in the expansion plan of BEC and the energy sector of the Bahamas		0%	605	100%	605

		The Bahamas Electricity corporation (BEC) includes RE alternatives in its expansion program						
Component 4 Institutional strengthening, analysis of the regulatory framework and integration and capacity building in the areas of EE and RE	TA	GoBH institutions strengthened for the adoption of EE and RE	-Guidelines for energy legislation, regulatory framework and policy options to adopt EE measures in public buildings, residential and commercial sectors, prepared -Regulation and policies to integrate RE and traditional energy in the energy matrix, prepared -Training and capacity building programs on RE and EE, implemented. - Preparation of National Energy Policy and reformulation of Bahamas Electricity Act, drafted.		0%	260	100%	260
Component 5 Dissemination and findings	TC	Results of the project are disseminated	-2 workshops to provide GoBH officials with capacity and training on EE and RE issues		0%	98	100%	98
Project management, monitoring, audits and contingencies				32[3]	0%	215	100%	247
Total Project Costs				1,000	26%	2,851	74%	3,851

[1] List the $ by project components. The percentage is the share of GEF and Co-financing respectively of the total amount for the component.
[2] TA = Technical Assistance; STA = Scientific & Technical Analysis.

[3] All of these funds are for contingencies sinceIADB funds will be used to pay for project management and monitoring

B. **SOURCES OF CONFIRMED CO-FINANCING FOR THE PROJECT** (expand the table line items as necessary)

Name of Co-financier (source)	*Classification*	*Type*	*Project*	*%**
GoBH	Nat´l Gov´t	Cash / In kind	590	21
IDB	Exec. Agency	Grant	1951	68
End-Users	Private Sector	Cash	310	11
Total Co-financing			2851	100

* Percentage of each co-financier's contribution at CEO endorsement to total co-financing.

C. FINANCING PLAN SUMMARY FOR THE PROJECT ($)

	Project Preparation a	*Project B*	*Total c = a + b*	*Agency Fee*	*For comparison: GEF and Co-financing at PIF*
GEF financing	0	1,000	1,000	100	1,000
Co-financing	0	2,851	2,851		1812.5
Total	0	3,851	3,851		2,812.5

D. GEF RESOURCES REQUESTED BY AGENCY(IES), FOCAL AREA(S) AND COUNTRY(IES)[1]

N/A

E. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

Component	*Estimated person weeks*	*GEF amount($)*	*Co-financing ($)*	*Project total ($)*
Local consultants*	30	18	88	106
International consultants*	214	53	1,600	1653
Total	244	71	1,688	1,759

* Details to be provided in Annex C.

F. PROJECT MANAGEMENT BUDGET/COST

Cost Items	*Total Estimated person weeks*	*GEF amount ($)*	*Co-financing ($)*	*Project total ($)*
Local consultants*	120		**120**	**120**
International consultants*				
Office facilities, equipment, vehicles and communications*			**20**	**20**
Travel*			**5**	**5**
Others**			**5**	**5**
Total	120		**150**	**150**

* Details to be provided in Annex C. ** For others, it has to clearly specify what type of expenses here in a footnote.

G. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT? yes ☐ no ☒

H. DESCRIBE THE BUDGETED M &E PLAN:

The Monitoring and Evaluation (M&E) of the outputs and outcomes presented in the Project Results Framework (Annex A), as well as, the monitoring of the day-to-day activities of the project will be supported through the development of an integrated and cost-effective project M&E system. This M&E system will be presented and finalized

at the Project´s Inception Meeting after reaching a consensus on the fine-tuning of indicators, sources of verification and the final definition of the project team M&E responsibilities

The M&E system will be coordinated by the Project Execution Unit (PEU) in the Executing Agency, the Ministry of the Environment (MOTE). The PEU will monitor the progress in achieving outputs and outcomes based on the Results Framework. Within the first 6 months, the PEU will ensure the consolidation of the baseline information for all indicators in the Results Framework. M&E results will be shared with other institutions participating in the project and in particular with the Bahamas Electricity Company (BEC).

The PEU in collaboration with the IDB will prepare an annual Project Implementation Review (PIR) in accordance with GEF requirements to be submitted to the GEF Secretariat including progress in achieving global environmental benefits, and the sustainability and replicability of project results. Estimated cost for the monitoring[4] of this project is US$ 80,000.

A mid-term evaluation (MTE), contracted by the IDB, will be carried out when 40% of the GEF resources have been disbursed or 12 months after the project contract goes into effect, whichever comes first. This review will determine if the project strategy is performing according to the established objectives, or if adjustments are necessary. The findings and conclusions of the evaluation will be presented and consulted with key stakeholders and beneficiaries in a mid-term evaluation workshop. In case adjustments are needed in the project implementation strategy, an Action Plan (AP) will be agreed between the IDB and the MOTE/PEU, establishing responsibilities and dates for completion of corrective actions.

The implementation of the AP will be monitored by the IDB. In addition, a final evaluation contracted by the IDB will determine, among others, the extent to which the project objectives have been reached in terms of the Project contribution towards the promotion and support of the development and implementation of sustainable energy sources in the GoBH, as well as sustainability of project outputs and outcomes and contribution to global environmental benefits.

The results of the evaluations, lessons learned, and good practices will be widely disseminated and shared. The evaluation activities estimated in US$ 20,000, will be funded by IDB and a third independent party will be hired for this purpose.

PART II: PROJECT JUSTIFICATION:

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

Country and sector issues

Electricity generation in Bahamas is based entirely on thermal plants powered by petroleum products. The larger-units plants are operated by the Bahamas Electricity Corporation (BEC) a publicly owned utility company and by another private sector company based in Grand Bahama. BEC is a vertically integrated, state-owned operation that is responsible for the generation, transmission, distribution and commercialization of electricity across most of the Bahamas, serving approximately 85% of all electricity consumers.

Although approximately 60% of the country's population resides on New Providence Island, BEC's area of supply extends to all of the major islands of the Bahamas with the exception of Grand Bahama and Inagua Islands under a unified national tariff for electricity. BEC operates 29 generating plants (28 diesel engine stations and I gas turbine power station) with an installed capacity of 438MW, providing service to approximately 98,000 customers. The Grand Bahama Power Company supplies electricity on the island of Grand Bahama serving some 40,000 consumers using diesel and turbine engines.

[4] The monitoring will be done as part of the project manager's activities, estimated as third of the total time dedicated to the project.

The annual consumption of (100% imported) petroleum products used to generate electricity was 9,490,000 barrels for the year 2008 and the electricity demand growth has progressed at an annual rate of around 3% for the last few years.

The electricity tariff structure is government regulated and does not completely transfer the real costs to the final consumer. Nevertheless, one relevant aspect is that the electricity tariff for the consumption of the first 800 kWh consists of a charge of 0.15 US$/kWh unit plus a variable fuel surcharge which is pegged to the price of oil. The electricity tariff for consumption over 800kWh is set at 0.18 US$/kWh plus a variable fuel surcharge. The average residential tariff for 2008 reached the maximum value of 0.3979 US$/kWh and this sent a clear indication to consumers.

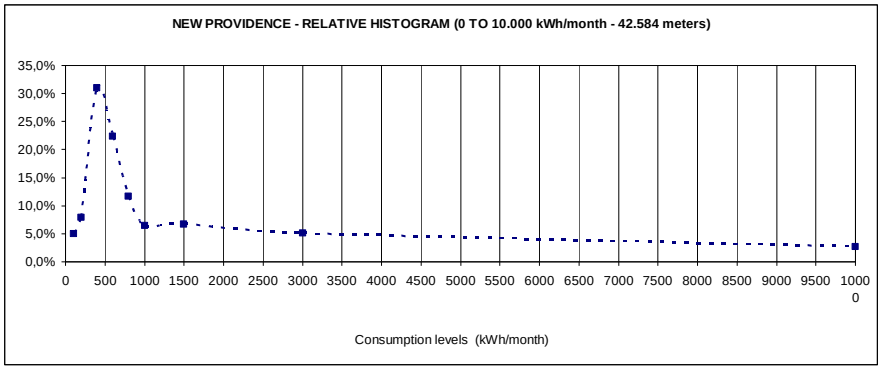
Residential tariffs references from other countries are shown in the table below.

Table 1: Residential Tariffs – Comparison

Country / Region	Residential Tariff (US ¢ per kWh)	Comments
Caribbean Islands		
The Bahamas	39.79	Maximum average for residential tariff in 2008
Dominican Republic	18.00	Tariff at the time when oil prices were high[5].
Jamaica	38.00	Tariff for July 2008[6]
Puerto Rico	35.00	Tariff at the time when oil prices were high[7]
Other countries/regions		
Brazil – State of Para	6.70 to 19.60	Depending on consumption level
Peru	9.00 to 21.00	Depending on consumption level and utility
Spain – national	10.00 to 15.00	Depending on consumption level

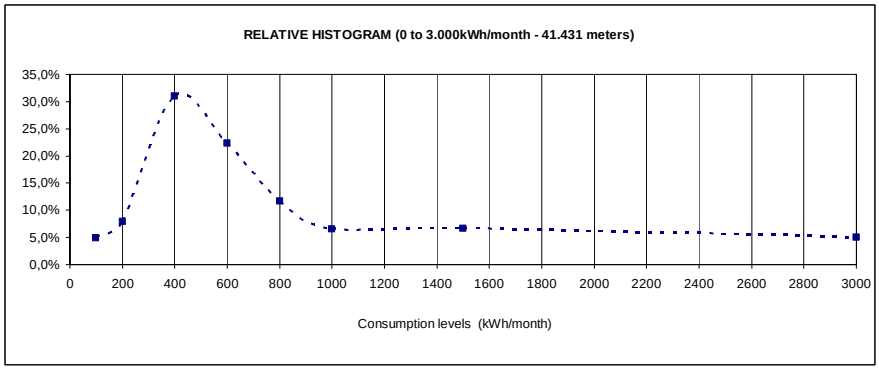
As shown in table 1, there is a clear correlation between electricity tariffs and oil prices (as the majority of the Caribbean Islands depend on imported fuels). Therefore, electricity tariffs tend to increase with international oil prices except for the Dominican Republic which has a heavily subsidized tariff and a higher penetration of RE (mostly hydro) and is now evaluating an increase of 6.4% in electricity tariffs as a result of high increases in electricity generation costs.

Awareness on electricity savings is very low and typical electricity patterns show higher than expected loads as shown in the histograms of individual consumptions for the year 2008 and from the aggregated generation profile for New Providence.



Relative frequency histogram of BEC meter readings in New Providence in 2008 (source: BEC)

[5] http://www.hoy.com.do/el-pais/2009/6/1/279877/Temistocles-Montas-justifica-alza-en-tarifa-electricidad
[6] March 9, 2009. 2009-2014 Tariff Review Application, Jamaica Public Service Company Limited
[7] http://www.hoy.com.do/el-pais/2009/6/1/279877/Temistocles-Montas-justifica-alza-en-tarifa-electricidad



Relative frequency histogram of BEC residential meter readings in New Providence in 2008 (source: BEC)

The consumption of BEC´s customers at the national level is approximately 1,536 GWH/year of which almost 40% (611.7 MWh/year) correspond to the residential sector. The principal uses of energy within this sector are: lighting, water heating, cooling and ventilation. At the New Providence level, the residential sector consumption is approximately 227,539 MWh/year (37% of total consumption in this sector) distributed as follows:

- 18.9% of the total customers consume more than 800 kWh/month, representing the 45.9% of total consumption
- 12.2% of the total customers consume between 601-800 kWh/month, representing the 14.7% of total consumption
- 23.3% of the total customers consume between 401-600 kWh/month, representing the 20% of total consumption
- 45.6% of the total customers consume less than 401 kWh/month, representing the 19.3% of total consumption

However, the median value (50% of consumers are below this level) is situated at 450kWh/month.

Based on an analysis of the generation load profile and the relatively low density LV distribution grids (except for highly populated neighbourhoods in major population centers like Nassau in New Providence where the LV distribution grid has a significantly higher density), distributed generation represents an interesting opportunity for the Bahamian power sector.
Consumers are scattered and demand patterns are mainly residential and services (including tourism). Therefore, the introduction of small / low voltage distributed generators would be technically viable (i.e., subject to the existence of suitable connection points), help smooth peaks in power demands and prevent voltage drops at distribution line ends. Additionally, self-generation and energy efficient appliances at the household level represent another interesting opportunity immediately to incorporate private capital in the electricity sector without any major changes in the sector.

Customer participation in distributed RE electricity generation and EE programs, which to date has been moderate, is potentially feasible due to the relatively high cost of electricity to consumers provided some critical barriers are reduced and market conditions are enhanced.

Key barriers to EE and RE investments

Main barriers to investment in EE and RE projects in The Bahamas include:

Legal and regulatory barriers

The current Electricity Act does not allow for the development of grid connected RE / WE alternatives in that it: (i) gives exclusive rights for the generation and sale of electricity to BEC or a franchiser thus prohibiting self-generation and interconnection to BEC´s grid; (ii) does not impose a requirement that a certain percentage of electricity generation be generated from RE sources. The former makes the connection of independent power production uncertain and does not provide an appropriate commercial framework for the development of electricity generation projects, and the latter

does not provide incentives for RE projects and the implementation of EE measures. A revised legal and regulatory framework of the Energy Sector would need to be in place to allow for the interconnection of RE and WE to the grid.

The current policies, legislation and regulatory framework are not sufficient to support the development and implementation of EE projects and should be reviewed to adopt EE measures in public buildings, residential and commercial sector (including the tourism sector).

Policy barriers

There is no clear national policy that supports the implementation of grid connected RE / WE projects and EE measures.

Recognizing that Bahamas depends on imported fuels to satisfy over 99% of its energy demand and since electricity is projected to grow at 8% over the next five year as a result of several new developments, in 2008 the GoBH decided to commit to the following National Energy Vision:

"The Bahamas will become a world leader in the development and implementation of sustainable energy opportunities by aggressively re-engineering our legislative, regulatory and institutional frameworks; retooling our human resources; and implementing a diverse range of well researched and regulated, environmentally sensitive and sustainable energy programs and initiatives, built upon geographical (both proximity and diversity), climatic (sun, wind and sea) and traditional economic strengths (tourism and banking)"

To support this vision the GoBH has appointed the National Energy Policy Committee (NEPC) that has already drafted a preliminary National Energy Policy, which is considered a step in the right direction. However, a new National Energy Policy strongly supporting the integration of RE / WE projects to the grid and implementation of EE measures will be needed to achieve the objective of this project.

Also, extensive consultations and dialogue among professional associations representing architects, engineers, builders, real estate developers, hotel operators, equipment suppliers and others will be necessary to obtain useful feedback for the design of an EE program and the set of rules and regulations to include RE in the energy matrix that would attract the full support of the main stakeholders.

Institutional barriers

The MOTE is the entity with the responsibility for the Energy Sector in the Bahamas; however it does currently not have a division specifically focused on promoting EE and RE and provided with the adequate means to do so effectively. The MOTE has the support of The Bahamas Environment, Science & Technology Commission (BEST) which manages and review environmental impact assessment and environmental management plans for development of projects proposed in the country including those destined to electricity generation. Also, the Public Utilities Commission (PUC) was established in 2000 under the provisions of the Public Utilities Commission Act for economic regulation of Electricity, Telecommunications and Water & Sewage services. However, the PUC only regulates Telecommunications at this time and it will only commence regulating Electricity on a date to be determined by the GoBH.

As mentioned earlier, BEC is responsible of the electricity supply for some 94,000 customers in New Providence (including Paradise Island) and 22 Family Islands and answers hierarchically to the MOTE. In mid 2008, BEC launched an initiative to seek Expression of Interest from specialized engineering services firm to assist them with the execution of a RE implementation plan. BEC is currently evaluating about a dozen proposals to generate electricity using several RE and WE technologies but does not have the necessary in-house expertise to complete the evaluation and implementation of these RE / WE projects.

In order to have a successful program to promote and support the development and implementation of sustainable energy sources in the Bahamas aimed at providing alternatives to reduce dependency on imported fossil fuel it will be

necessary to have an institutional structure with the necessary means to: (i) effectively reach out to all stakeholders and increase their awareness; (ii) promote the development and enforcement of all necessary incentives and policies; (iii) coordinate the various initiatives across the country in order to optimize the overall results. One of the aims of this project is to provide the necessary institutional strengthening to the Energy Sector in Bahamas for the successful promotion and implementation of a sustainable energy program implementation.

Professional and technical capacity barriers

There is a shortage of technical capabilities for the development and execution of grid connected RE / WE projects in Bahamas. BEC engineers and technicians have virtually no experience with grid connected RE generation with the exception of a 31.2 kW solar photovoltaic project installed by the Cape Eleuthera Institute under the auspices of The Cape Eleuthera Island School to help develop sustainable industries in South Eleuthera.

Also, there is a shortage of trained professionals capable of understanding the RE / EE technologies and qualified contractors to install and maintain EE and RE equipment. In particular, there is limited experience with energy audit procedures and analysis and insufficient capacity for conducting EE surveys and audits and determining the cost of new EE appliances, pubic lighting and EE cooling systems.

To assist in narrowing this gap, in March 2009, the private sector arm of the IDB held a free one-day workshop on EE in Nassau with the attendance of about 50 small business owners and consultants as part of GREENPYME, a program which was set up to provide know-how, tools and technical and financial support for implementing EE measures and clean technologies to help small and medium sized enterprises become more competitive

Adequate training and capacity building will be provided in order to allow for the successful promotion and implementation of RE / WE and EE projects in Bahamas. This will include the training and capacity building of BEC´s engineers and technicians for the preparation of RE and WE programs to reduce their dependency of fossil fuels, energy audits and to erect, operate and maintain RE technologies

Technical barriers

The introduction of RE / WE generation owned and operated by Independent Power Producers (IPPs) into BEC´s power generation program will require the reinforcement of the power generation control systems and the power dispatch regulations to plan, coordinate and implement the integration of such facilities into the energy matrix. IPPs using RE technologies will need to have take into consideration the variability in the dispatch of energy and how to compensate this fact. In addition, power grids may need to be upgraded depending on the location and capacity of the proposed RE / WE projects that would be proposed for interconnection to the grid.

RE and EE perception and awareness barriers

There is a general perception and awareness for RE and EE that involves all major stakeholders. The general public has limited awareness of the benefits of RE and EE and therefore there is a low social commitment to sustainable energy. Banks have virtually no experience in financing these type of projects and are not aware of their profitability and the level of risks that are involved. The commercial sector, perhaps with the exception of some of the major international hotels, do not fully appreciate the medium to long term benefits of investing in RE or EE technologies. Government institutions have not yet managed to convey to the public their commitment to RE and EE with coherent policies, dissemination of information and the provisioning of financial incentives.

Financial barriers

Financial institutions and commercial banks are not familiar with EE / RE investments and can not adequately evaluate the benefits and risks of entering into this market niche. Also, specific tariff / policy reforms should be enacted to provide the necessary financial incentives for EE and RE installations together with disincentives for the use of non EE appliances and equipment.

The proposed project has been designed to contribute to the removal of these barriers by focusing the funding to be provided by GEF and IDB on the implementation of three pilot projects which will serve to evaluate the feasibility of the proposed technology solutions, determine the potential for replication on a large scale to help achieve the project goals and objectives.

Project Rationale

The increase in the cost of oil and it volatility, coupled with the increased national demand for energy has generated a huge economical burden for the Caribbean in general and in particular for the Bahamas which could significantly benefit from incorporating RE as well as WE and EE programs into their energy matrix. This would lead to significant benefits including a drop in the import of fossil fuels, generating important savings and energy security to the GoBH, and most importantly it would also lead to a decrease in carbon emissions. The latter is especially important given that the annual average emission of 6.7 tons of CO_2 per person places The Bahamas among the highest per capita emitters of Greenhouse Gases (GHGs) in the world.

The Bahamas have RE resources that could generate electricity, such as solar and wind power, waste, and ocean thermal energy and, like many of the Caribbean islands, it could benefit significantly, by incorporating RE as well as WE and EE programs into its energy matrix. Not only would the imports of fossil fuels drop, generating important savings to the nation, but also carbon emission would decrease, which could generate an interesting potential to sell carbon emission reductions (CERs), through the Clean Development Mechanism (CDM) developed under the Kyoto Protocol or other carbon voluntary markets. This project will assess the potential for carbon emission reduction following GEF guidelines for the calculation of carbon emission reductions although it will not finance the preparation of Project Design Documents (PDDs) or similar instruments to trade carbon credits.

The Bahamas has also a high untapped potential for the implementation of EE measures. Its economy is predominantly based on the provision of services (i.e., tourism and banking) which demand significant amounts of power for the provision of lighting, cooling, and operating electrical equipment and appliances. Between 40 to 60 percent of the electrical power demand at hotels is used for cooling due to the use of inefficient heating, ventilating and air conditioning (HVAC) technologies and existing building designs. Domestic lighting is still dominated by incandescent lighting and close to 90 percent of households have electric water heaters. Cooling and lighting services for government and commercial buildings represents another area with significant EE potential.

Given the identified barriers mentioned above, the proposed GEF project aims at promoting and supporting the development and implementation of sustainable energy sources in the Bahamas by providing alternatives to reduce dependency on imported fossil fuels via a combination of technical assistance and the design and implementation of three pilot projects, two of which will be financed with GEF funds.

The overall project has been structured under five components, complementary to each other, as described below:

Component l: EE for public buildings, commercial and residential sector: This component will consist of:

Subcomponent 1.1 – A TA to: (i) assess energy uses and electricity consumption patterns, (ii) adapt energy audit protocol and procedures to standardize energy audits in the Bahamas; (iii) conduct EE surveys and audits for public buildings, residential and commercial sector, and determine the cost for new EE appliances, public lighting, EE cooling systems, etc; and (iv) design of a financial instrument to promote EE. The project (with IDB resources) will also finance studies to determine if a market approach is the most feasible option for expanding the use of EE;

Subcomponent 1.2- Pilot project to promote the use of CFLs in the Bahamas: The project will implement an EE pilot project which will focus on the phasing out of incandescent light bulbs through their replacement by CFLs in low income households in New Providence and in some of the Family Islands (Abaco, Eluthera and Exuma). This pilot project will be financed with funds provided by IDB.

Since the GoBH does not have an official definition of low income households, the following criteria will be used for selecting of households to be included in the pilot project:

- Households with electricity consumption up to 400 kWh/month which are considered representatives of low income;
- Households built or in process of being built under a government housing program

The goal of this pilot project is to replace a portion of the incandescent light bulbs in a sample population of low and middle income households with CFLs throughout BEC´s territory in the Bahamas. Since the aim of the overall pilot project is to replace up to approximately 150,000 incandescent lights with CFLs, the pilot project will be conducted in two stages to optimize its implementation based on the experience gained from the results of the first stage of the pilot project.

Based on discussions with the MOTE, the Department of Environmental Health Services from the Ministry of Health (MOH), the Department of Social Services (DSS) from the Ministry of Labour and the IDB the first stage of the program will be implemented within New Providence in a sample population of five low and middle income neighbourhoods where most of these households have at least 10 bulbs in use and on average more than 50% are incandescent bulbs. On average, light bulbs are used 4-5 hours daily, an adequate quantity of hours to generate attractive savings. The typical capacities of functioning incandescent light bulbs are 60W and 75W and the average monthly electricity bill for these households ranges represents between 5 and 15% of the average income of a low and middle income household in New Providence. On average, there are 4 to 8 persons per household.

The key activities of the pilot program comprise:

(i) The replacement of functioning incandescent bulbs with an equal number of compact of CFLs. On average, 5 CFLs[8] of 13W, 15W and 20W will be installed in exchange for an equal number of functioning incandescent light bulbs. The disposal of the functioning incandescent bulbs will be done in accordance with environmentally sensitive disposal practices.

(ii) Even though the CFLs could be easily installed by the beneficiaries, during the first stage of the pilot project these will be installed by a MOTE's contractor and/or by BEC's employees in the households selected by DSS. The installers will also corroborate that the electrical installations are in accordance with code and inform the beneficiaries that they should maintain electricity consumption at the same level during the implementation of the pilot project (i.e., at least 2 to 3 months). Also, BEC may need to calibrate the electricity meter of the households to be part of the first stage of the pilot project

(iii) Before and after the replacement of incandescent bulbs takes place, a public awareness campaign on the benefits of EE and conservation measures with particular emphasis on efficiency lighting will be established. The objective of this public awareness campaign is to support the execution of the pilot project and increase the general knowledge of the population vis a vis the benefits of adopting EE measures. This awareness campaign should result in greater and sustained use of energy efficient lighting.

The experience gained from the first stage of the pilot project will be used to adjust the pilot project implementation procedures which will be applied during the second stage. It is envisioned that the second stage of the pilot project would include the replacement of incandescent lights for CFLs in New Providence as well as in some of the Family Islands as Abaco, Eleuthera and Exuma. These Family Islands have the most representative of low income households as it was defined in this study. The targeted beneficiaries for the Family Islands will be selected based upon the experiences gained from the implementation of the pilot test program in New Providence.

Energy Savings

Table 2 below shows the estimated energy savings which would result from the implementation of the pilot test project in suggested areas of New Providence which are based on the following assumptions:

[8] The CFLs will be required to meet the standards of the International Electrotechnical Commission (IEC) with regard to safety, performance, construction, technical specifications and energy efficiency. (i.e., IEC:84:1989 and IEC-1008-1; 61167; 60081; 60598; 60901; 60969; 60064; 60432; 60968). The maximum amount of Hg allowed will be 5 mg.

Bulbs per house	6
Average capacity incandescent bulbs (W)	60
Average capacity CFL (W)	15
Hours of use daily	4

Table 2: Estimated energy savings generated by the CFLs pilot program

Neighborhood	Number of households (estimated)	Total of CFLs	Capacity installed incandescent bulbs	Capacity with CFLs	Energy consumption incandescent bulbs	Energy consumption CFLs	SAVINGS	
			kW		kWh/year		kW	kWh/year
Total Pilot Project	**25,000**	**150,000**	**9,000**	**2,250**	**13,140,000**	**3,285,000**	**6,750**	**9,855,000**
Pilot Project 1st phase	**2,500**	**15,000**	**900**	**225**	**1,314,000**	**328,500**	**675**	**985,500**
Garden Hills	600	3,600	216	54	315,360	78,840	162	236,520
Pinewood Garden	600	3,600	216	54	315,360	78,840	162	236,520
Jubilee Garden	500	3,000	180	45	262,800	65,700	135	197,100
Dignity Garden	400	2,400	144	36	210,240	52,560	108	157,680
Center Ville	400	2,400	144	36	210,240	52,560	108	157,680

The information gathered from this pilot project will help the GoBH to evaluate the energy savings potential that might be achieved by replacing incandescent lights with CFLs on a large scale and provide a more precise indication of the incentive levels to be given in order to achieve the expected level of savings.

Subcomponent 1.3 – Pilot project for Solar Water Heater (SWH) systems: With GEF funds, the project will implement a SWH pilot project[9] to evaluate the capital and energy savings potential that can be achieved by using SWH systems on a large scale and provide an indication of the incentive levels to be given.

Hot Water (HW) demand is a high energy demand for the household sector. The use of electric water heaters (tanks) and on demand electrical heaters to produce HW is a very inefficient way in terms of primary energy usage. For the oil dependant electricity sector in the Bahamas Islands, the use of electricity for HW generation translates into a high cost in terms of fuel consumption and available engine power capacity to supply the national demand for HW.

The high availability of solar radiation (5.4 kWh/m^2 day) and its regularity mean that SWH ought to be an excellent technology to provide this basic service. Although this technology has been successfully introduced and diffused in many countries worldwide with a high solar resource (e.g. Greece, Israel, Turkey, Spain, Barbados), even leading to the development of legal enforcement of solar water heating in new developments and major renovations, there are virtually no previous experiences in the Bahamas, thus remaining an unknown alternative for domestic energy supply.

The main bottleneck for the potential diffusion of this technology is the general lack of effective knowledge about its cost-effectiveness, which undercuts an eventual market driven promotion within the residential sector. Consequently, the first demonstration of the benefits of this technology in the Bahamas needs to be led by the public sector agents under a SWH systems pilot project which will comply with the following requirements:

- size of the pilot project has to cover a household sample large enough to be representative and provide useful data on energy demand, solar equipment performance, maintenance requirements, etc.
- households typologies must be representative of the whole Bahamas islands
- solar equipment must be installed preferably on the roofs, at the same tilt of the sloped roof
- proposed technical solution should be feasible both for existing or new houses

[9] The solar collector components of the SWH systems will have to comply with standard EN 12975-2: 2006 Thermal solar systems and components. Solar collectors. Test methods

In order to facilitate the monitoring of the installation process, commissioning and measurement of energy savings, the implementation of the pilot project will take place primarily in a new (to be built) urban social housing development comprised of detached single family houses in New Providence Island to be selected by the MOTE. The SWH pilot project also contemplates the installation of a significant number of SWH in other existing detached single family houses, in order to address the integration of SWH to existing HW installations. The proposed pilot demonstration project aims at evaluating the feasibility of introducing of SWH systems in the Bahamas, and will address the following issues:

- determining final implementation cost of a typical SWH system
- esthetical aspects of integrating SWH systems into existing houses
- structural aspects of mounting SWH systems on the roof
- integration of SWH to the existing HW generator and comparison of energy savings
- determining the need for a back-up system
- providing capacity building and training to plumbers and contractors
- increasing presence of local solar sector (i.e., equipment suppliers, certified installers) and enhancing their technical, marketing and financing capabilities
- identifying other energy saving measures to be implemented by the users of SHW systems

The sizing of a SHW for a reference single-family house follows the principle of assuring a year-round supply of hot water, with a solar fraction so high to make unnecessary any other back-up system. However, the solar fraction obtained by the sizing calculation should always be less than 100% in order to avoid the permanent overheating of the collector and the solar tank. In the unlikely event of long periods without sun, the SHW temperature will be less of 40ºC, but warm enough to take a shower. The target groups for pilot implementation will be households with families of 4 (or less) and 5-6 (or more) members.

Two SHW models will be selected for each target. The detailed specifications of the SWH systems will be included in the TORs for the procurement of these systems and adjusted based on the actual size / roof configuration of the houses that will be actually selected for the pilot project. The inclusion of internationally recognized standards for SWH systems and certification schemes for installers will be taken into consideration for the preparation of the TORs for the procurement of the SWH systems (these TORS will take into consideration SWH best practices and cost, such as those of Barbados, which has the most SWH systems installed per household in the Caribbean). As a reference, and for the purpose of the calculations of Global Environmental Benefits for this project, the following tables show the sizing process.

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Table 3: Basic parameters for the SWH reference systems*

Solar Hot Water System	Unit	SHW 140	SHW 210
HW consumption	l/day	140	210
Energy requirements	kWh/year	1,597	2,176
Standard SHW equipment	m2	2.50	4.00
HW tank	L	150	200
Energy production	kWh/year	1,428	1,978
SHWS productivity	kWh/m2 year	571	495
Solar fraction	%	89	91
SHW equipment cost	US$	3,875	4,772
Payback period (on demand heater)	Years	5.84	7.19
Payback period (electrical tank heater)	Years	5.14	6.33

*Costs do not include taxes. The payback periods shown relate to the replaced electric heating systems (on demand or tank).

The SWH pilot project will encompass the following activities:

- installing one 100% subsidised SWH system per house in a social housing development plus one partially subsidized SWH system per house in existing detached single family houses to be selected in a range of about 134 households, depending on the SWH model installed in each household.
- two models of SWH will be installed - a small one (SWH140) for dwellings of 2 rooms, and a larger one (SWH210) for dwellings with 3 rooms
- SWH systems will include a monitoring system for metering and storing data on solar production, hot water consumption and other useful variables that will provide real data on domestic thermal energy consumption levels.
- participation of the building contractor for the social housing government program, who will be responsible for the installation of the SWH systems with its own plumbers
- for the installation of SWH systems in existing detached single family houses, existing owners will be asked to pay at least for the installation cost in order to increase their level of commitment and awareness and begin assessing the viability of a financial mechanism which would involve consumer co-funding depending on the consumer willingness to pay once the pilot project is launched.
- implementation of a parallel training programme targeted certified plumbers and contractors to provide adequate capacity building and training
- development of a marketing strategy with adequate financial tools including subsidies, for a future large scale replication.

The expected outputs of the SWH pilot project are:

- implementation of demonstration SWH systems, totalling around 435m2 of installed solar collector surface in a range of about 134 households.
- availability of operational data from these systems, that will enable the design of large scale replication actions
- capacity building of certified plumbers and contractors on SWH technology
- definition of a financial and administrative model for a large solar water heating programme in the Bahamas

Energy savings

It is expected that each SWH system will reduce the electricity consumption by around 1,970 kWh per year, with the corresponding reduction in the yearly electricity bill; considering the residential tariffs in May 2009, the yearly reduction would be of around 442US$. Considering the tariffs in August 2008, when the fuel surcharge (related to oil barrel prices) reached its maximum, the yearly reduction would be of US$784.

The information gathered from this pilot project will help the GoBH to evaluate the energy savings potential that might be achieved by using SWH systems on a large scale and give a more precise indication of the incentive levels to be given in order to achieve the expected level of savings.

Component 2: Assessment of the Renewable Energy potential. cost and viable options to include RE and WE in the energy matrix: This component will be consist of:

Subcomponent 2.1 : a TA to (i) assess the potential for RE especially for WE, OTEC, solar and wind applications, analyze the best options for electricity generation with RE and support the preparation of the RE policy; (ii) determine cost of implementation of these RE technologies; (iv) establish a prioritized plan of action to include RE in the energy matrix of the Bahamas; (v) support the preparation of a WE assessment that will identify the possible options to obtain energy from landfills and other sources of waste; and (vi) identify potential for bio-energy production, including the potential to develop a biodiesel market from recycled cooking + oil from cruise ships and the tourism industry. The project (with IDB resources) will also finance studies to determine if a market approach is the most feasible option for expanding the use of PV in households around the Bahamas;

Subcomponent 2.2 - Pilot projects for household Photovoltaic (PV) systems and net metering devices: The GEF funds will finance the design and implementation of a pilot project for RE, covering grid connected Photovoltaic (PV)

plants[10]. Net metering will be considered as a part of the pilot project, to clearly identify the energy delivered /received by the customer / producer.

The key barriers to the rationalisation of energy consumption and deployment of RE in the Bahamas have been described in previous sections. Regarding the potential contribution of solar PV technology in domestic electricity consumption, the barriers can be summarised as follows:

- under the current electricity legislation, households acting as IPPs can not sell electricity to the grid but they would be able to offset their electricity consumption
- general lack of knowledge and awareness on energy consumption (power and use of each appliance, impact on energy bills)
- low capacity (resources and specific technical training) of main institutional agents (BEC, MOTE) in solar technologies, planning and H&S aspects
- lack of detailed breakdown of electricity costs (generation, transmission, distribution, and commercialisation) which hinders the identification and prioritisation of optimisation measures in general, and the assessment of the cost-effectiveness of RE based generation in particular.

The high availability of solar radiation (5.4 kWh/m^2 day), its regularity and the annual temperature range of 20º to 27ºC indicate that PV systems are an excellent technology to generate electricity in the Bahamas. The main benefits of this technology are:

- universal solution for the residential sector
- PV plants do not have moving parts, thus requiring a simpler technical maintenance
- long life-span; operational life of the principal components (PV modules) is of 25 years or more
- PV systems can be retrofitted to any suitable (i.e., conveniently tilted and oriented / shadow free) surface, for instance residential housing roofs
- several successful international experiences in developing a grid-connection scheme for small distributed generators, based on PV technology.

Even though in the Bahamas there have been a few experiences with PV technology and there is an incipient offer of professional local contractors who supply these systems, the high investment costs of PV systems and the lack of a grid-connection scheme hamper the diffusion of this technology. Hence, there is a case for a demonstration project with a substantial subsidy to offset initial investment costs and complying with the following conditions:

- an assessment of a net metering connection scheme to BECs distribution lines, including BECs commissioning procedures
- the pilot project size has to benefit a user sample large enough to be representative and provide useful data on PV equipment performance, and reduction of residential electricity consumption.
- the PV panels must be installed preferably on the roofs, at the same tilt of the sloped roof
- the technical solution should be feasible both for existing (retrofitting) or new houses

The following key aspects will be assessed:

- user willingness to pay level for investing in a PV system
- estimating final costs of implementing PV systems in the Bahamas
- addressing esthetical aspects of PV panels integration on the existing houses
- determining operational performance of small distributed generators, delivering power to the grid

[10] The PV systems will be required to have crystalline or thin film silicon PV modules that comply with the norm IEC 61215:2005 edition 2 and shall be qualified to and be classified by Class according to IEC 61730-1 and IEC61730-2.

- meeting technical capacity building needs; target groups include BEC personnel, certified electricians and private developers and contractors
- determining potential for fostering domestic energy saving awareness among residents

The Solar PV pilot project will:

- develop technical and operational procedures for grid connection, based on net metering principles.
- implement an application procedure for users to apply for the subsidy, including the technical and financial requirements to be submitted by applicants.
- enable the execution of a representative sample of PV systems, to be installed in a range of 20 to 30 private households
- PV systems in each household should contribute to a maximum of 70% of their current average electricity consumption.
- include a tender for the provision of technical assistance services
- provide for PV systems that include an exhaustive monitoring equipment to log performance data (solar production, balance of electricity, electricity fed into the grid, performance ratio, etc.)
- include actions on capacity building and training for BECs technical personnel, certified electricians and private contractors in order to stimulate stakeholders entrepreneurship.
- develop a mixed-market driven promotion scheme, based on the combination of a subsidy and cofinancing by consumers
- draw possible large scale replication scenarios, considering a PV penetration rates (% of PV contribution to the Bahamas generation mix) of 5%, 10% and 20% .

Considering residential electricity consumption patterns in the Bahamas and taking a median value of 450kWh/month per household[11], a referenced PV system providing up to 70% of this consumption in the Bahamas will have the following characteristics:

Table 4. Average PV system characteristics

PV generated per average household	MWh/year	3.78
PV average capacity (STC) per household	kWp	2.52
PV surface needed per household	m^2	18.90
PV plant cost (turn-key) per household (excluding taxes)	USD	$21,420

(Source: based on solar radiation from NASA database)

Each 2.52 kWp PV plant is expected to save around 3,780 kWh per year in electricity consumption, with the corresponding reduction in the yearly electricity bill. Based on the residential tariffs of May 2009, the electricity cost reduction would be of around US$1,200 per year. If the tariff of August 2008 is applied, when the fuel surcharge related to oil barrel prices- reached its maximum, the yearly reduction in electricity cost would be of around US$1,504.

To provide certain degree of flexibility to different user profiles interested in applying for a pilot PV system (i.e., applicants with electricity consumption below and above 450kWh/month on average), the system size range considered for the pilot project will be from 1.2 to 12kWp (1 to 10kW AC power).

In order to assess the viability of a financial mechanism which would involve consumer co-funding, the pilot project will consider a user contribution of 30% of the PV plant investment costs, depending on the consumer willingness to pay once the pilot is launched.

The information gathered as a result of this pilot program will help the GoBH to evaluate the energy savings potential resulting from the implementation of PV domestic plants on a large scale and provide an indication of the tariff subsidies or other incentives which will be necessary to achieve the expected level of savings.

[11] Refer to the histograms of meter readings from BEC described in section A

The expected outputs of the PV pilot project are:

- implementation of demonstration PV systems, totalling around 65kW of PV capacity (STC) in a range of 20 to 30 private households, depending on the PV system size installed in each household
- availability of operational data from these systems, that will enable the design of large scale replication activities
- capacity building of certified electricians and contractors on solar PV technology
- capacity building of BEC staff on PV interconnection users
- definition of a financial and administrative model for a large grid-connected PV programme in the Bahamas

Component 3: Strengthening the Energy Sector in the Bahamas: This Component will include a TA which has been designed to: (i) review the results of the financial audit made to BEC; (ii) assist BEC in improving its operational and financial management (e.g., establishment of indicators for measurable improvements of operational efficiency, tariff structure, including technical and commercial losses, thermal generation efficiencies, increased collection ratios) in order to strengthen the capacity to service debt; (iii) based on the results of the review, analyze alternatives on how to improve BEC's cash management, and (iv) prepare a strategic pipeline that includes refinancing options, future financing needs for expansion of its system and financial viability for BEC's long terms investments (analyzing and prioritizing projects). This component will also explore alternatives for BEC's expansion plan specifically including RE through (v) assess BEC's expansion plan, including the potential diversification of their energy matrix by using RE; (vi) prepare a prioritized list of projects; (vii) determine cost of implementation of RE technologies; and (viii) establish a prioritized plan of action to include RE in the energy matrix of the Bahamas.

Component 4: Institutional Strengthening and capacity building in the areas of EE. RE and WE: This component will: (i) provide TA to review and recommend legislation, regulatory and policies issues to adopt EE measures in public buildings, residential and commercial sector (including tourism sector); (ii) provide TA to review and recommend legislation, regulatory and policy issues to integrate RE and WE and traditional energy (diesel, fuel oil and eventually NG, if it is available) in the energy matrix of The Bahamas; (iii) provide the GoBH with training and capacity building to prepare energy conservation plans, prepare RE and WE programs to reduce their dependency of fossil fuels, train energy audits, energy technicians and operators to erect, operate and maintain RE technologies; and (iv) with the information gathered and generated in the previous components this subcomponent will support the preparation of the National Energy Policy and the reformulation of the Bahamas Electricity Act.

Component 5 Dissemination of findings: Under this component will be finance at least two workshops to validate and disseminate the findings of the technical studies and pilot projects, helping the MOTE to identify the interested sectors (the affected community in particular) and develop communication and participation strategies during project development and implementation. The MOTE in coordination with the GoBH, will implement a long-term public education and awareness strategy for Sustainable energy in the country.

Expected Global Environmental Benefits to be Delivered

The project will contribute to generate Global Environmental Benefits in the form of:

- Carbon emission reductions
- Financial savings due to avoidance of diesel purchase

The mitigation of greenhouse gas emissions is derived from the implementation of the three proposed pilot projects. Both, the installation of CFLs and the use of SWH will diminish energy demand thus reducing carbon emissions from the grid. The deployment of grid-connected PV generation will displace energy generation thus reducing carbon emission from fossil fuel combustion by grid-connected thermal plants.

Based on GEF guidelines the total CO_2 emission reductions (ERs) that would be achieved by the implementation of these projects are composed of:

- *direct emission reductions* and
- *indirect emission reductions*

The direct ERs are comprised of direct project ERs and direct post-project ERs. Direct post-project emissions reductions has not been considered since no GEF funds will be used after the project is closed.

Direct ERs have been estimated based on the following assumptions:

- Pilot project to promote the use of CFLs in the Bahamas:
  - Electricity savings: 11,333 MWh/year; considering the installation of 150,000 light bulbs and 15% electricity losses.
  - Lifespan of efficient lighting technology: 6 years; in accordance with the estimated lifespan for CFLs.
  - CO_2 emission factor: 0.76 tCO_2/MWh; is used as indicator for the low carbon technology applied in this project.
- Pilot project SWH Systems:
  - Minimum Electricity savings: 295.5 MWh/year; considering the installation of 435 m^2 of solar collectors and 15% due to electricity distribution losses
  - Lifespan of SWH technology to be employed: 20 years.
  - CO_2 grid emission factor: 0.76 tCO_2/MWh; estimated based on the Bahamas grid configuration.
- Pilot project Solar PV Systems:
  - Electricity savings: 113 MWh/year. Each kWp installed will save around 1,500 kWh per year and up to 65 kWp would be installed
  - Lifespan of PV technology to be employed: 25 years.
  - CO_2 grid emission factor: 0.76 tCO_2/MWh; estimated based on the Bahamas grid configuration.

Indirect ERs represent emissions reductions that could take place during the following 10 years after project implementation. The indirect ERs contemplate the replication effect of the project due to EE and RE awareness activities developed by the project, in accordance with GEF emission reduction guidelines. Two methods for calculating these emissions are provided by GEF guidelines: "bottom-up" approach and "top-down" approach.

The following assumptions were used for estimating the indirect ERs:

- Pilot project to promote the use of CFLs in the Bahamas:
  - Market penetration: it is estimated that over the next 10 years it would be possible to install 1,000,000 lamps (CFLs) in the households. The accumulated ERs are estimated assuming that 100,000 lamps are being installed per year.
  - Replication factor: 4 since this corresponds to the first phase of a nationwide government funded CLFs replacement campaign
  - Energy savings include 15% electricity losses
  - GEF Causality Factor: 20% since this pilot project is not directly financed by GEF, therefore GEF contribution is weak with regards to future actions
- Pilot project SWH Systems:
  - Market penetration of SWH technology in single family households: 10%. This is the most conservative scenario out of the four scenarios under study
  - Replication factor: 3; as suggested by GEF Guidelines for Market Transformation activities.
  - Causality Factor: 60%. GEF contribution to this project is substantial because there is a need to encourage the use SWH instead of electricity and this could be evidenced by the deployment of this project to measure the benefits *in-situ*.
- Pilot project Solar Photovoltaic (PV) Systems:
  - Market penetration of PV technology: 5%. This is the most conservative scenario out of the three that are under study.

- Replication factor: 3; as suggested by GEF Guidelines for Market Transformation activities.
- Causality Factor: 60%. Bahamas will tend to become a low-carbon economy and therefore further actions (beyond this pilot project) in the RE field are probably going to be taken due to "baseline shifts", for example due to a deep modification of the Energy Sector legislation to include RE generation technologies. Moreover, this PV pilot project is intended to promote the use of PV for electricity generation among private stakeholders that are aware of the impact that imported fuels have on the electricity bill. Therefore, there is an incentive to change in the baseline (electricity bill) but the pilot project is important in order to test the real impacts of the technology *in-situ* (economic, social, financial and environmental). Therefore, GEF contribution is modest and substantial indirect emission reductions can be attributed to the baseline.

The expected direct and indirect environmental benefits are presented in table 5.

Table 5: Expected Global Environmental Benefits to be delivered by the project[12]

Type of Carbon emissions	SubComp. 1.2 (CFLs)	SubComp. 1.3 (SWH)	SubComp. 2.3 (PV)	Total Benefits (tCO2)
Direct emissions reductions (tCO_2)	**53,780**	**4,491**	**2,147**	**60,418**
Direct post-project emissions reductions (tCO_2)	**-**	**-**	**-**	
Indirect emissions reductions – Bottom Up (tCO_2)	**215,121**	**13,474**	**6,442**	**235,037**
Indirect emissions reductions – Top Down (tCO_2)	**958,820**	**269,484**	**756,960**	**1,985,264**
CO_2 ER (Direct + BU) (tCO2)	**268,901**	**17,965**	**8,589**	**295,455**
CO_2 ER (Direct + TD) (tCO2)	**1,012,600**	**273,975**	**759,107**	**2,045,682**

Refer to attached spreadsheets where the estimate of emission reductions is calculated.

The direct emissions reductions consider the avoided CO_2 emissions from thermoelectric generation (representing approximately 100% of the energy matrix, based on diesel oil) as a consequence of energy savings from reduction in electricity consumption. Table 4 shows potential savings in terms of diesel that would be avoided by the implementation of these pilot projects. It is clear that the avoidance of purchasing diesel oil will result in attractive financial benefits.

B. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH NATIONAL AND/OR REGIONAL PRIORITIES/PLANS:

This project is highly consistent with the national priorities and plans for the Bahamas both in terms of its focus and its nature. The country has seven principal areas of strategic focus in the energy sector: (i) economic efficiency; (ii) EE-using less energy to provide the same level of service; (iii) energy conservation as a result of a more efficient use of energy or by reducing energy consumption through behavioural changes (iv) clean energy, including RE; (v) diversification and security of energy supply; and (vi) meeting the energy needs of the poor. This project is consistent with numerals (ii) through (vi) because it will assist the GoBH to develop a National Energy Policy; strengthen BECs technical and financial capacity; develop RE alternatives; achieve EE in public buildings, residential sector and commercial sectors and will help to diversify the energy matrix to reduce dependency on imported fossil fuels

[12]Each estimate was done over the corresponding lifetime for each project.

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

This project is consistent with GEF Strategic Program 1 (Promote EE in residential and commercial Buildings) and GEF Strategic Program 3 (Promote market approaches for RE).

The Project will focus on the removal of legal, regulatory and technical barriers to the penetration of RE and EE technologies by providing technical assistance to the GoBH to achieve EE in public buildings, residential sector and commercial sectors, and implement demonstration projects, in particular the phase-out of incandescent lights by replacing them with CFL; exploring alternatives for RE and implement pilot projects in RE; (iv) supporting the GoBH with a review of energy legislation, regulatory and policy issues to promote sustainable energy as well as institutional strengthening in the areas of EE and RE; and disseminating the findings. GEF resources will be used to finance two pilot/demonstration projects one in RE consisting of the installation of PV generators on buildings, using net metering devices and the other in EE via the installation of SWH in representative parts of the Bahamas.

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

GEF funding will help overcome the barriers for establishing EE measures and increasing the RE component of the energy matrix in Bahamas. The project will reduce the energy consumption in the residential and commercial sectors, increase the utilization of RE and at the same time contribute to the reduction of GHG emissions. The GEF funding will be used to fund incremental costs related to the project. The GEF funding (US$ 1.0 million) will be leveraged by US$2.85 million of co-financing from the GoBH and the IDB as well as from end users of the PV plants. The funding requested from GEF represents about 26 % of the total project costs.

E. OUTLINE THE COORDINATION WITH OTHER RELATED INITIATIVES:

This project will coordinate with the other ongoing activities of the IDB in the Bahamas. As a response to the GoBH request for Technical Assistance (TA) IDB, the IDB has approved the following Technical Cooperation (TC) projects:

i. Strengthening the Energy Sector in the Bahamas (BH-T1012 in execution ATC/OC-11436-BH)[13]: This TC is being financed by the IDB´s Infrastructure Project Preparation Fund (Infrafund). The specific objectives of this TC are to: (i) provide technical assistance to the Ministry of Finance and the MOTE to assist BEC in achieving financial and operational sustainability; (ii) explore alternatives for BEC's expansion plan including RE and WE; (iii) prepare an analysis of the current regulatory, financial and fiscal frameworks with recommendations to achieve a sustainable energy matrix in The Bahamas; and (iv) support institutional strengthening in EE and capacity building in the areas of RE and WE.

ii. Promoting Sustainable Energy in the Bahamas (BH-T1016 in execution ATN/MC-11467-BH)[14] : This TC is being financed with funds from the IDBs Sustainable Energy and Climate Change Initiative (SECCI). The specific objectives of this project are to: (i) provide technical assistance to the GoBH to achieve EE in public buildings, residential sector and commercial sectors, and implement demonstration projects; (ii) explore alternatives for RE and implement pilot projects; (iii) support the GoBH with a WE program; and (v) institutional strengthening and dissemination of findings.

In addition to the Infrafund and SECCI approved TCs, IDB is preparing another project to support EE in Bahamas, namely:

iii. Promotion of Energy Efficient Residential Lighting (BH-T1018) (US$500,000): This Investment Grant (IG) funded by the SECCI, aims to reduce the electricity bills of the most vulnerable sector of the Bahamian

[13]The cost of this TC approved in December 2008 is US$875,000, of which the IDB would finance up to US$700,000 on a contingent recovery basis with funds of the Infrafund. The GoBH will contribute US$175,000 as counterpart funding in cash.

[14] The cost of this TC approved in January 2009 is US$875,000 of which the IDB is financing up to US$750,000 on a non-reimbursable recovery basis with funds of the SECCI. The GoBH will contribute US$187,500 as counterpart funding in cash. Under the scope of this TC, the resources of this GEF project will be used to implement pilot projects in EE and RE.

population through energy savings with the provision of CFLs and increasing awareness of the benefits of energy efficiency and conservation. The IG resources will finance the phase-out of incandescent lights by replacing them with Compact Fluorescent Lamps (CFL), which is part of the EE implementation plan under this GEF program.

All of theses initiatives are complementary and will be coordinated by the MOTE that is also the executing agency of this GEF project. The proposed GEF project in addition to the Infrafund and SECCI technical assistances, will provide to the GoBH with tools and information required for decision making, in particular through design and implementation of demonstration programs in EE and RE which will lead to an investment loan for BEC, estimated in US$ 50 million, to refinance the company and include RE and EE technologies in their expansion plan.

F. DISCUSS THE VALUE-ADDED OF GEF INVOLVEMENT IN THE PROJECT DEMONSTRATED THROUGH INCREMENTAL REASONING :

At present in the Bahamas, there are no promotion schemes for EE and / or RE initiatives and neither does the current regulatory framework allow for the connection of RE generation to the grid. In an effort to identify potential opportunities to reduce dependence on fossil fuels, the GoBH has requested IDB´s technical assistance to assess the national energy sector, and to determine the Bahamas´ potential for both EE and RE. The implementation of the GEF funded pilot projects will help tackle these barriers by providing solid data and information derived from three pilot projects: CFls, SWH and PVs. The knowledge acquired from these demonstration projects will be essential for the development of policy and legislation for the country, and will facilitate the introduction EE appliances as well as RE technologies and projects.

The inclusion of RE in the energy matrix and implementation of EE measures will generate energy savings and financial savings as less oil will have to be imported. Carbon emissions reductions will also be obtained and fossil fuels (e.g diesel) consumption will be reduced, creating a positive environmental impact for the Bahamas.

Table 6: Savings in terms of diesel

	Pilot project CFLs	*Pilot project SWH*	*Pilot project PV*
Barrels saved per year	**20,180**	**605**	**201**
Volume saved (gal/year)	**847,576**	**25,414**	**8,452**
Costs savings US$[15]	**1,311,700**	**39,325**	**13,065**

In the case of SWH systems, there is lack of capacity for the deployment of this technology, the SWH pilot project including capacity building for installers, training on operation and dissemination of the benefits will facilitate the deployment of this technology at a larger scale.

Although the Bahamas offers substantial benefits for the installation of PV grid connected systems, the current energy legislation does not allow for the interconnection to the grid. GEF support for the PV grid connected pilot project will be key to demonstrate the benefits of having PV grid connected systems in place. Moreover, additional training will be provided to BEC's staff to monitor the PV systems operation.

Without GEF funding the project would not be able to build a reliable and convincing case to demonstrate that with EE and RE programs the Bahamas will save energy, involve civil society (residential consumers), diversify its energy matrix with RE and reduce to some extent the imports of expensive fossil fuels

[15] Considering 65 US$ per barrel

G. INDICATE RISKS, INCLUDING CLIMATE CHANGE RISKS, THAT MIGHT PREVENT THE PROJECT OBJECTIVE(S) FROM BEING ACHIEVED AND OUTLINE RISK MANAGEMENT MEASURES:

RE and energy conservation in general are strongly correlated to the price of oil. If the price drops so does the interest to adopt EE measures or implement RE technologies. Given the volatility of the oil price, the GoBH has decided to go ahead with the proposed project even if the price of oil is low to reduce dependency of foreign oil, diversify the energy matrix and prepare the country for a future scenario with high oil prices. Since The Bahamas is in the tropical cyclone belt, the installed equipment for pilot projects purchased with GEF funds could be impacted or destroyed. The study will minimize this risk by examining multiple sites and developing contingency measures with the local project team to minimize the damage and protect the equipment

Technical Risks

Technical risks are relatively low, as all the technology components to be used in the project will be mature, off the shelf products.

PV panels are quite reliable, but eventually the balance of plant equipment may not perform well under the conditions of the Bahamas electric grid, as has been the case in previous phases of the project. However, this risk can be minimized by properly specifying equipment from well-established suppliers with multi-year track records of satisfactory performance. The selected equipment suppliers will also need to offer a comprehensive set of product warranties on their products. No emerging PV technologies will be used in this project. BEC personnel are fully qualified and training will be provided for handling PV technology and ancillary equipment, including quality assurance procedures.

Regarding the SHW systems, there is some uncertainty with respect to system sizing and there is no consistent code of practice for installations and system performance monitoring. Therefore, there is a risk that systems will be over-sized resulting in loss of cost-effectiveness or that systems will be undersized resulting in poor hot water delivery performance. One component of the GEF project will address the training requirements of design professionals to ensure appropriate system sizing.

There is also a potential risk that low quality solar products will reach the Bahamas market place and perpetuate the often stated observation that solar systems are of low quality and an unreliable long-term option, mainly for water heating. The project stakeholders are well aware of these problems. Solar system component quality issues are - on a limited scale - being addressed by the GoBH through development of procurement standards for buying PV and SHW systems. The GEF project will also seek to mitigate the risk through activities that put in place mechanisms that promote good quality products entering the market to ensure a sustainable/long-term market development.

Market Risk

Main market related risks associated with the project include:

The cost-effectiveness of solar water heating systems is a significant determinant of the market penetration. Based on current solar system capital costs, the purchase of electric heaters is the most economically attractive option for water heating. However, solar water heater systems are competitive with electric water heating when taking into account not only the initial capital investment but the low maintenance costs of the solar systems and the reduction in energy costs. While the project does not make provision to counter possible future low petroleum prices, project activities are designed to reduce the cost of solar systems by reducing dealer mark-ups through increased sales volumes, thereby increasing the competitiveness of solar water heating systems.

There is a risk that the solar water heating system market will not develop sufficiently during the project to ensure sustainability of the Bahamas supply and service industry. The present situation is that importer and installer mark-ups are higher than they will be at market maturity. The GEF project will provide support to market development activities that result in lower risks for suppliers and enable cost reductions.

There is also a risk of a change in the electricity tariff. The market entrance point for PV systems is based on the fact that the tariffs are sufficiently high for them to become financially viable. However, the electricity tariff in Bahamas is linked to the cost of fossil fuels.

Project Implementation Risks

Operational Risk: Operations of the PEU are dependent upon several inputs and working with variety of organizations. Any delay on the part of the partner organization or inadequate performance can have effect on the operations of the PEU. Effective management and leadership qualities of the MOTE team manager would help to overcome these difficulties.

Other Risks and Issues

Under the current electricity regulatory framework, self generation is not allowed in the Bahamas. One can safely assume that this situation will change in the future, and in fact current proposed technical activities sponsored by the IDB on RE contemplate a modification of the regulatory framework.

Net metering is not specifically allowed and regulations in this direction need to be approved to foster market development. Barrier removal activities are considered in the project to mitigate this risk.

Risk Matrix

RISK	RATING	ABATEMENT MEASURES
Technology failure or underperformance.	L	Technical risks are relatively low, as all the technology components to be used in the project will be mature, off the shelf products. Rigorous technical specifications will be developed and used in international bidding processes. Equipment providers must have a proven track record and will need to provide comprehensive product warranties. No emerging technologies will be used in this project. Training courses will be made for BEC personnel as well as certified electrician and plumbers to mitigate this risk.
Financial mechanisms do not promote sufficient demand needed for project expansion	M	The inclusion of financial studies and barrier removal activities in the area of energy policy and economics will provide institutional support for the financial mechanisms.
Lack of acceptance by user	M	Outreach campaign highlighting economic advantages of on-grid PV technology and Solar Hot Water systems Campaign to increase environmental awareness on energy issues and Energy Efficiency

Sustainability (including Financial Sustainability)

Short term sustainability relates to the successful implementation of the project in terms of its action plan, goals and products. It will be guaranteed by the timely provision of the necessary resources (human, financial, technical and institutional) to bring the project to successful completion. Consistent with overall the RE and EE initiative that IDB is implementing in Bahamas, the long term sustainability will be ensured through the activities related to resource and technological assessment, policy changes, human and institutional development, capacity building and increased public awareness. Financial sustainability of the pilot projects is expected through the net metering regime, a more aggressive cost-reduction curve through the expansion of residential PV systems and the cost-benefits associated with reduction of energy bills. Each of the relevant barriers identified during project preparation and within project scope has been targeted by project activities with appropriate allocations of the necessary resources (human, financial, technical and institutional) to bring the project to successful completion.

Replicability

Project activities will strengthen the capabilities, awareness and support of policy-makers, BEC, technology providers and local technology users and have been designed to accompany the technical aspects of the project with the creation of knowledge and the strengthening of the policy framework. The scaling up of activities related to the PV and SHW pilot project will be ensured through the programmatic activities related to policy changes, human technical and

institutional development, capacity building, and the gradually increasing participation of the MOTE in project implementation. Finally, the project dissemination strategy will engage relevant stakeholders and build consensus around the inclusion of renewable energies in the Bahamas energy matrix.

Monitoring and Evaluation

PV and SHW system performance will be monitored on a regular basis, both in terms of its physical and operational status, as well as user satisfaction and benefits to both the grid and the user. Records will be kept and lessons learned will be documented. Provisions will be taken to monitor systems performance for a reasonable period after project termination.

A final report will be prepared by the MOTE at the end of the project, to be submitted to the IDB and GEF for evaluation by external reviewers. This report will include all technical and non-technical results, as well as a compendium of the main lessons learned. A final, independent evaluation will also be carried out. Since the project has significant demonstration value for the GEF, appropriate arrangements will be made by the MOTE to facilitate access to data and/or on-site visits by interested parties from other parts of the Bahamas and the world, in order to facilitate project replication by third parties.

H. EXPLAIN HOW COST-EFFECTIVENESS IS REFLECTED IN THE PROJECT DESIGN:

The proposed project will directly and indirectly contribute to the achievement of local and global environment benefits, by reducing energy consumption which translates directly into carbon emission reductions as Bahamas's energy matrix is mainly fossil fuel-based.

The allocation of GEF Financing of US$ 1 million will result in an estimated direct GHG emissions reduction of 60,418 tCO2e, as well as an indirect GHG (bottom up approach) emissions reduction of 295,455 tCO2e (see details in table 5)[16]. The abatement cost of the total carbon emission reduced is GEF **US$ 3.38/tCO2e**.

This cost is below the cost effectiveness of other GEF financed projects, according to a review of GEF projects[17]. In this review, ongoing EE projects had an average of US$ 4/tCO2e of GEF financing cost-effectiveness, and US$ 6/tCO2e for projects under preparation. This means that this project is cost-effective as it is below the expected range of costs of similar GEF projects.

The implementation of these pilot projects will provide attractive financial savings in terms of diesel purchase avoidance for energy generation, estimated in US$ 1.36 million/year (see Table 6). If we consider a conservative 10-year lifetime for the equipment this would be US$ 13.6 millions. Moreover, if the volatility on international fuel prices continues and if the adoption of RE technologies is successful, it is expected that these projects will be replicated throughout Bahamas thus contributing to bring financial savings for the country, the utility and end users.

As a conclusion, the cost of the proposed interventions under this project is considered cost effective for achieving the expected energy, institutional, environmental and social benefits. The manners in which this project have been designed is considered to be the most efficient alternative to achieve positive results in the short and medium term, as this project pave the way for more EE and RE project that would contribute to reduce CO_2 emissions and diversify the Bahamas´ energy matrix.

PART III: INSTITUTIONAL COORDINATION AND SUPPORT

[16] For conservative reasons, this estimate of direct GHG emissions reduction does not take fully into account the impact of end-customer´s contribution under the SWH and PV pilot projects. Hence, the actual level of direct GHG emissions reduction might be higher.
[17] World Bank,(2004), "*WB-GEF Energy Efficiency Portfolio Review and Practitioners' Handbook"*, World Bank Environment Department, Climate Change Team.

A. INSTITUTIONAL ARRANGEMENT:

In the early 90´s the Energy Sector was under the control of the Ministry of Works and Utilities and in 1956 the Electricity Act provided the establishment of the BEC incorporating the electrical installations formerly owned by the Government. Today BEC responds to the MOTE, being responsible for the electricity supply for some 94,000 customers in New Providence (including Paradise Island) and 22 Family Islands. The BEC service area excludes Grand Bahama Island were 19,000 customers are served by Grand Bahama Power Company (GBPC), a private utility. Since 1994, the MOTE also has the support of BEST which manages and reviews environmental impact assessments and environmental management plans for development of projects proposed in the country, including those programmed by BEC and GBPC.

The GoBH, through the Ministry of Finances (MF) and the MOTE has requested to the IDB support for the development of a comprehensive study on BEC´s operations, in the financial, technical, and operational frameworks. The preparation of this study will lay the foundations of a more extensive and long-term program to solve BEC´s issues aiming an efficient electricity service in The Bahamas, as well as to promote RE, WE and EE developments. Currently the MOTE is executing the IDB funded technical cooperation BH-T1012 that addresses the issues mentioned previously. The MOTE is also executing another IDB sponsored technical cooperation BH-T1016 that focuses on RE, EE and WE and BH-T1016.

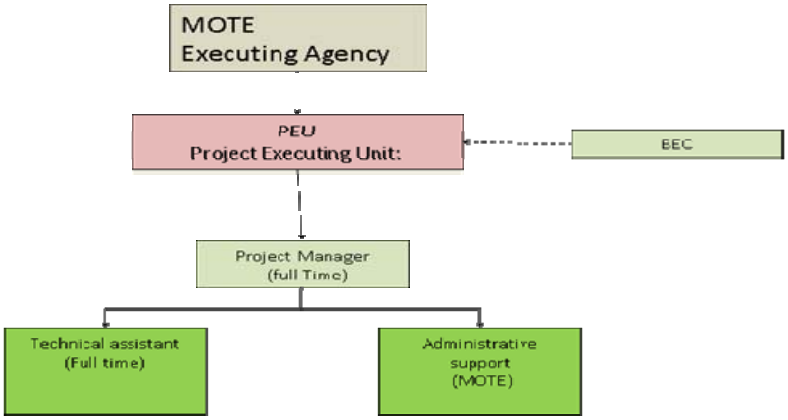
B. PROJECT IMPLEMENTATION ARRANGEMENT:

Executing Agency**:** The MOTE will designate as the national executing agency (EA). The areas of responsibilities of the MOTE are

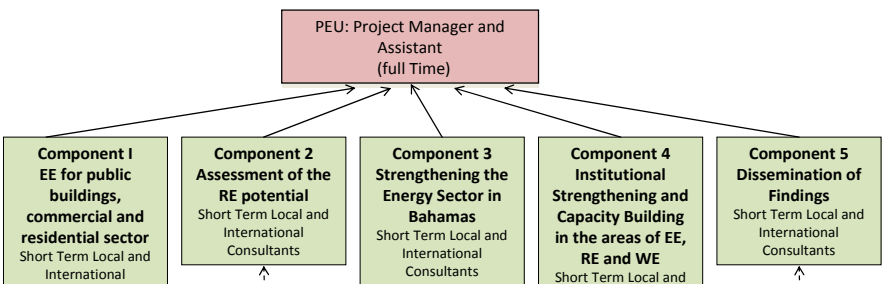
- The Bahamas Environment, Science and Technology Commission (BEST)
- Department of Physical Planning
- Port Department
- Department of Meteorology
- Department of Environmental Services

So it has the technical qualifications to lead a project that the one being proposed in this document.

Executing mechanism: It is proposed that a Project Executing Unit (PEU) be established in the MOTE main building to execute the proposed GEF supported project. This will reduce costs by making use of the already established administrative and coordination routines. The PEU will be staffed by the MOTE personnel with the collaboration of. BEC



The PEU will have coordination meetings with representatives of the MOTE, the Ministry of Labour and Social Development, the Ministries of Education and Health. The concerns of end-user groups and individuals will be addressed.



Monitoring and Evaluation: The project will be closely monitored in accordance with IDB established monitoring procedures. Consequently, the IDB office in Nassau will provide ongoing performance monitoring with backstopping from IDB technical staff in Washington. Lastly, a mid-term evaluation will be carried out at the end of the second year of implementation, funded by IDB. Further procedures for overall project review will be detailed at project document formulation stage.

Based on the Logical Framework matrix and on the already identified project outputs, clear and quantifiable performance indicators and benchmarks will be further refined in the project document formulation process and substantive project monitoring will be implemented along these defined parameters.

PV and SWH system performance will be monitored on a regular basis, both in terms of their physical and operational status, as well as user satisfaction and benefits to both the grid and the user. Records will be kept and lessons learned will be documented. Provision will be made to monitor systems performance for a reasonable period after project termination.

A final report will be prepared by the PEU at the end of the project, to be submitted to the IDB and the GEF for evaluation by external reviewers. This report will include all technical and non-technical results, as well as a compendium of the main lessons learned. A final, independent evaluation will also be carried out, financed by IDB.

Procurement: Contracts for works, procurement of goods and related services, and contracts for the services of consultants will be responsibility of the MOTE. Procurements will be carried out accordance with IDB Policies for the Selection and Contracting of Consultants Financed by the IDB (GN-2350-7) and Policies for the procurement of works and goods financed by the IDB (GN-2349-7); with the provisions established in the Program Agreement and the respective procurement plan. In addition the hiring of consultants and procurement of goods will require the non-objection of the IDB.

PART IV: EXPLAIN THE ALIGNMENT OF PROJECT DESIGN WITH THE ORIGINAL PIF:

There are some changes in project design in comparison with the original PIF. Here are the main modifications:

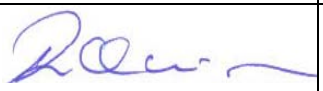
- Additional co-financing has been provided by IDB. This co-financing will be used for the provision of the CFL lamps in Component I, under Subcomponent 1.2
- A new Subcomponent 1.3 – Pilot project for SWH systems has been added to Component I. This new Subcomponent will be funded by the GEF funds which were previously assigned to the replacement of incandescent lamps by CFLs.

These changes improve substantially the impact of the pilot project, facilitating the reduction of fossil fuel dependency.

PART V: AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies and procedures and meets the GEF criteria for CEO Endorsement.

Agency Coordinator,		Date	Project		

Agency name	Signature	*(Month, day, year)*	Contact Person	Telephone	Email Address
Ricardo Quiroga IDB GEF Executive Coordinator Environment, Rural Development and Disaster Risk Management Division Inter-American Development Bank		July, 31, 2009	Christiaan Gischler Energy Specialist Inter-American Development Bank	202-6233411	christiaang@iadb.org

ANNEX A: PROJECT RESULTS FRAMEWORK (THE BASELINE AND TARGET HAS TO BE NUMERIC IF POSSIBLE)

Goal	Reduce GHG emissions associated with electricity generation by promoting the use of RE				
	Indicator	*Baseline*	*Target*	*Sources of verification*	*Risks and assumptions*
Objective: promote and support the development and implementation of sustainable energy sources in the Bahamas providing alternatives to reduce dependency on imported fossil fuels					
Component I: EE for public buildings, commercial and residential sector with the implementation of demonstration projects in EE, in particular the replacement of incandescent by Compact Fluorescent Lamps (CFL) and installation of solar water heaters at the residential level					
Outcome 1.1: Potential for EE is identified	▪ Energy consumption of buildings, appliances and equipment used	▪ No EE regulations / incentives exist ▪ No EE in commercial, residential and commercial buildings applied	▪ National EE program	▪ Project files ▪ Audits and surveys	▪ GoBH adopts the recommendation toward the implementation of EE policies ▪ The general public adopts EE measured promoted by the project
Output 1.1.1: Assess energy uses and electricity consumption patterns	▪ Energy consumption of buildings, appliances and equipment	▪ No energy consumption baseline by end use / sector	▪ Energy consumption baseline by end use for each sector is developed	▪ Project files ▪ Energy audits samples	▪ GoBH and the utility companies support the initiative
Output 1.1.2: Standardize energy audit protocol and procedures	▪ Energy audit protocol data	▪ No standardized energy audit protocol and procedures	▪ Standardized energy audit protocol and procedure in place	▪ Project files	▪ Political support to establish new standardized energy audit protocol ▪ Professionals and local contractor cooperate to develop standards
Output 1.1.3: Energy audits are performed and energy and cost of new EE equipment is determined	▪ Energy consumption of buildings, equipment and appliances ▪ Cost of new EE	▪ Energy audits not done and EE equipment and appliances are not used	▪ List of potential energy efficiency measures by sector (at least 4 for residential, 3 for hotels and hospitals and 2 for	▪ Technical audit reports ▪ Energy bills ▪ EE calculation	▪ New standards to assess building energy performance are officially adopted

	equipment and appliances		restaurants ▪ Energy Efficiency Model is in place	methodology and tools	▪ Technical capacity is in place to perform energy audits
Subcomponent 1.1: Pilot Project to promote the use of CFLs in Bahamas					
Outcome 1.2: EE savings are demonstrated via the implementation of a pilot project to replace with CFLs, a portion of the incandescent light bulbs in low income households	▪ EE benefits in terms of energy and cost savings	▪ No EE measures tending to save energy in low income households are in place	▪ Energy savings pf 9855 MWh/yr and 6.75 MW	▪ Promotion ▪ Surveys ▪ Research	▪ Assumptions: ▪ A high quality technology of CFLs ▪ An adequate level of quality service ▪ Enough participation of households
Output 1.2.1 Implementation program for CFLs replacement in place	▪ Number of households accepting the replacement of the incandescent bulbs	• No bulb replacement program in Bahamas is in place for low income households. • Small penetration of the CFLs in the low income households: less than 50% of the total number of lights	▪ Pilots project is implemented ▪ Verification of energy savings of 9,855 MWh/yr	▪ Pilot project Monitoring reports ▪ Users surveys	▪ Willingness of households to participate in the pilot project
Output 1.2.2 Lessons learned from the pilot project published and disseminated	▪ Number of attendants at seminars ▪ Number of publication distributed	▪ Lack of experience in EE projects ▪ Lack of understanding of impact in energy consumption of EE measures	▪ Provide guidelines for future EE campaigns ▪ Delivery knowledge on: - Energy conservation by using EE lamps - Energy savings potential in the residential sector - Preparation of EE programs - Impact assessment	▪ Project documents ▪ Results from the impact assessment of the pilot project	▪ Lack of interest by GoBH ▪ Lack of interest by BEC
Output 1.2.3 EE awareness campaign designed and implemented on top of the CFLs inclusion campaign	▪ Public awareness is in place to promote the use of CFLs and EE	▪ The population knows about the CFLs but they don't know about their benefits ▪ No public awareness in EE measures' benefits	▪ At least 1 (one) Awareness Campaign implemented to: ▪ Increase knowledge of CFLs technology, their benefits in terms of energy reduction and costs ▪ Increase knowledge of EE measures	▪ Sites visits ▪ Surveys in a sample of households in a pilot projects sites ▪ Commercial data base of BEC's customers	▪ A National promotion plan is in place
Output 1.2.4 Monitoring and evaluation plan is implemented	▪ Established procedures to measure the energy savings	• No monitoring and evaluation plan	• A monitoring and evaluation plan is in place	▪ Monitoring measurements of the energy consumption ▪ First monthly bills after the implementation of the first stage of the pilot project	▪ All customers have meters ▪ Proper conditions to installs meters on transformers

Subcomponent 1.2: Pilot Project for Solar Water Heaters					
Outcome 1.3: EE savings are demonstrated via the implementation of a pilot project to install SWH in households					
Output 1.3.1: Financial and administrative model for SHW systems program is in place	1) pilot SHW systems level of operation after 6 months of the service start-up	1) No promotion scheme for SWH available at the moment	1) Good performance of more that 80% of the pilot domestic SWH systems installed after 6 months following service start-up	1) Pilot SWH systems Monitoring reports 2) Users surveys	1) Users fulfill their SWH maintenance duties 2) Users recognize the environmental benefit of using solar energy
Output 1.3.2: Capacity building to certified plumbers and contractors	1) Private key actors (certified plumbers and building development contractors) strengthened for the promotion and installation of SWH systems 2) Participation of the target groups in the capacity building events organised	1) Few private key actors (certified plumbers and building development contractors) have been involved in solar systems, mainly PV systems for electricity self-consumption. 2) No specific integral training events have been realised on Solar Thermal technologies in the Bahamas	1a) Capacity building of 10 certified plumbers and contractors	1) Interested plumbers and building contractors are fully aware of the benefits and impacts of SWH systems; 2) Workshops realised – programmes, reports	- MOTE officials highlight the importance of the adoption of solar systems. - Plumbers and building contractors recognise the environmental benefits of using solar energy instead of fossil fuels.
Output 1.3.3: Implementation of demonstration projects	1) Progress of pilot SWH systems execution 2) Involvement of the key stakeholders 3) public awareness	1) No integral promotional SWH scheme existing	1) 100% of the planned pilot SWH systems are commissioned and started operating 2) All the relevant stakeholders (MOTE, users, plumbers and contractors, local and international consultants, etc) participate, support the pilot project and perform their respective duties with excellence 3) Local and international media report on the pilot project	1) Visual inspection of SWH systems 2) Pilot project progress reports 3) Final report for this component presented and approved by the MOTE and the IDB.	- GoBH highlights the importance of the introduction of RE to the energy matrix, both for economic and environmental reasons.
Output 1.4.4: Operational data from pilot sites is available for large-scale replication	1) Basic performance parameters 2) Operational performance parameters	1) Only data on solar radiation is available	1) Basic performance parameters are readily available for 80% of the pilot SWH systems 2) Operational performance parameters are readily available for 80% of the pilot SWH systems	1) Monitoring reports 2) Data loggers in each of the pilot SWH systems	1) Users co-operate with local consultants for the access to monitoring data
Component II: Assessment of the RE					

potential , cost and viable options to include RE in the energy matrix					
Outcome 2.1: Feasibility of different RE technologies participation in the energy matrix of BH is demonstrated	▪ Number of feasibility studies on different technologies	▪ Very limited economic and technical data different RE	▪ 3 Feasibility studies done for RE alternatives	▪ Technical studies on RE	▪ Environmental and financial limitations ▪ Lack of natural resources
Output 2.1.1: Determine potential for RE, determine best RE options and support preparation of the RE policy.	▪ Data from resource measurement programs (i.e., wind, solar etc)	▪ No information on RE resource potential	▪ Study for the assessment of RE application is established	▪ Project files and reports ▪ Field testing and measurement reports	▪ RE resource potential is insufficient to generate a key impact on the energy matrix
Output 2.1.2: Determine implementation cost for RE alternatives	▪ Clear understanding of the cost structure (investment, and O&M) for different RE technologies	▪ No implementation cost data exist	▪ Cost analysis of implementation for RE technologies is in place	▪ Project files ▪ Technical studies on RE	▪ Implementation cost of RE alternatives proves to be too high for certain technologies
Output 2.1.3- Prioritized plan of action to include RE in energy matrix	▪ Development of an action plan for RE in Bahamas	▪ No RE in energy matrix	▪ Plan of action on how to incorporate RE /WE in the energy matrix is in place	▪ Reports and studies	▪ GoBH is willing to incorporate RE in the energy matrix in spite of its costs
Subcomponent 2.1: Pilot Project for household Photovoltaic systems and net metering devises.					
Outcome.2.2: : RE potential is demonstrated via the implementation of a pilot project to install PV systems connected to the grid					
Output 2.2.1: Financial and administrative model for grid-connected PV systems program is in place	1) pilot PV systems level of operation after 6 months from the service start-up 2) Level of Interest for large-scale replication after the pilot project	1) No promotion scheme for domestic PV available at the moment	1) Good performance of more that 80% of the pilot domestic PV systems installed after 6 month, following service start-up 2) Applications are received for installing PV systems in more than 5% of New Providence households	1) Pilot PV systems Monitoring reports 2) Users survey 3) Net metering mechanisms for connection to the grid are presented; 4) Recommendations for RE alternative financial support options are presented;	1) Users fulfill their maintenance duties 2) Users recognize the environmental benefit of using solar energy
Output 2.2.2: Capacity building to BEC personnel, certified electricians and contractors	1) BEC technical staff strengthened for the commissioning of grid connected of PV systems, and security aspects (general protections, islanding);	1) BEC technical staff has no previous experience on small (<100kW) generators connection to the grid 2) Few private key actors (certified electricians and	1) Training of 5 technical staff at BEC on commissioning and safety aspects 2) Capacity building of 10 certified electricians and contractors	1) BEC staff and executives are trained to face the challenges and opportunities of solar technology, resulting in BECs effective support for the adoption of PV systems;	- BECs executives and members of the Board highlight the importance of the adoption of solar systems. - Electricity consumers recognise the environmental benefits of

	2) Private key actors (certified electricians and building development contractors) strengthened for the promotion and installation of PV systems 3) Participation of the target groups in the capacity building events organised	building development contractors) have been involved in stand-alone PV systems, for self-consumption. 3) No specific integral training events have been realised on grid-connected PV systems in the Bahamas		2) Interested electricians and building contractors are fully aware of the benefits and impacts of PV systems; 3) Workshops realised – programmes, reports	using solar energy instead of fossil fuels.
Output 2.2.3: Implementation of demonstration projects	1) Progress of pilot PV systems execution 2) Involvement of the key stakeholders 3) public awareness	1) No integral promotional PV scheme existing	1) Up to 65 kWp in approx. 26 PV plants are installed. 2) All the relevant stakeholders (MOTE, BEC, electricians and contractors, local and international consultants, etc) participate, support the pilot project and perform their respective duties with excellence 3) Local and international media report on the pilot project	1) Visual inspection of PV systems 2) Pilot project progress reports 3) Final report for this component presented and approved by the MOTE and the IDB.	GoBH highlights the importance of the introduction of RE to the energy matrix, both for economic and environmental reasons.
Output 2.2.4: Operational data from pilot sites is available for large-scale replication	1) Basic performance parameters 2) Operational performance parameters	1) Only data on solar radiation is available	1) Basic performance parameters are readily available for 80% of the pilot PV systems 2) Operational performance parameters are readily available for 80% of the pilot PV systems	1) Monitoring reports 2) Meters and Data loggers in each of the pilot PV systems	1) Users co-operate with BEC staff and local consultants for the access to monitoring data
Component III: Strengthening the Energy Sector in the Bahamas					
Outcome 3.1: Capacity to asses financial and operational aspects of the energy sector including uses of RE is built.	-BEC's Management Procedures -Inclusion of RE in BEC's expansion plan	-Lack of knowledge on how to asses uses of RE with regard to financial and operational aspects	-Provide feasible alternatives for the improvement of BEC's Management Procedures within 12 months - Achievement of financial and operational sustainability in BEC within 12 months	-Periodic audits -Reports on the evolution of the expansion plan implementation (including RE)	-Existence of potential for deployment of RE initiatives in The Bahamas
Output 3.1.1: Analysis of technical and non-technical electricity losses in transmission and distribution lines	-Percentage of electricity losses in transmission and distribution lines	-Lack of monitoring of electricity losses	-Locate and measure electricity losses in order to improve the transmission and distribution lines by minimizing them. -Reduce electricity losses to 10%	-Monitoring reports	Availability of qualified manpower and equipment to monitor electricity losses
Output 3.1.2: Diagnostic of BEC's operational and financial current situation	-Financial statements of BEC -Operational procedures of BEC -BEC'S cash management	No understanding of BEC's current operational and financial current situation	-Provide an analysis to improve the operational and financial situation of BEC	-Financial and operational audits -Interviews and surveys to key stakeholders	Availability of trained auditors to provide the required services
Output 3.1.3: Modeling and forecasting BEC's financial statements based	-Financial statements of BEC -Financial forecasts including	-Need for refinancing options -Need to explore financial	-Provide assistance in the development of forecast and modeling based on expansion programs	-Comparison of actual situation with forecasted financial situation, based on	Existence of expansion programs including RE

on expansion programs	expansion activities	viability for BEC's long- term investments	including RE	expansion programs	
Outcome 3.2: Bahamas Electricity Corporation (BEC) includes RE alternatives in its expansion program	-Assessment of BEC's potential for diversification with RE -Expansion program objectives	-Dependency on fossil fuels that impacts on the financial situation and operating costs of BEC.	-Establish a plan of action that includes RE projects in the energy matrix of the Bahamas.	-Expansion Program monitoring -Implementation of RE Pilot Projects or Demonstration Projects	Expansion program to be done
Output 3.2.1: RE alternatives to be included in the expansion of the energy sector are prepared	-Expansion Plan	-Very limited inclusion of RE in the energy matrix	-Prioritized list of RE projects including technology costs	-Monitoring of expansion program implementation	Identification of at least one RE alternative to be deployed within the Expansion program
Component IV: Institutional strengthening, analysis of the regulatory framework and integration and capacity building in the areas EE, RE and WE					
Outcome 4.1: GoBH institutions strengthened for the adoption of RE and EE	-National Energy Policy -Bahamas Electricity Act	-Lack of capacity for the inclusion of REand EE measures as part of a National Energy Policy and the Bahamas Electricity Act	-Promotion of the use of RE and EE measures including recommendations to adopt EE measures in public buildings, residential and commercial sector	-Official GoBH communications with regards to adopted policies on energy issues	GoBH supports the improvement of the National Energy Policy and the Bahamas Electricity Act
Output 4.1.1: Provide guidelines for energy legislation, regulatory framework and policy options to adopt EE measures in public buildings, residential and commercial sectors	-Guidelines -Legislation -Regulations -Policies	-Lack of promotion of the use of RE in the National Energy Policy	- Provide guidelines for the creation of a regulatory framework in a 12-month period for The Bahamas to ensure the sustainable development of the national energy sector	-Reports -Official GoBH communications	GoBH supports the improvement of the National Energy Policy
Output 4.1.2: Recommend regulation and policies to integrate RE and traditional energy in the energy matrix		No regulations and policies for the integration of RE in the energy matrix	Regulation and policy recommendations for the integration of RE in place	Project files	GoBH and Energy Sector supports the improvement of the National Energy Policy
Output 4.1.3 Training and capacity building on RE and EE issues	-Diagnostic of the present situation, based in existing information and interviews of key stakeholders	-Lack of tools and knowledge on how to include in RE and EE in the energy matrix	-Delivery of training in: - Energy conservation plans formulation - Preparation of RE and WE programs - Energy audits -Erection, operation and maintenance of RE technologies		
Output 4.1.4 Support preparation of	▪ National Energy Policy ▪ Bahamas Electricity	-Current National Energy Policy and Bahamas Electricity Act do	-Recommendations for a National Energy Policy and changes to the	-Policy evolution monitoring	▪ GoBH makes an objective effort

National Energy Policy and reformulation of Bahamas Electricity Act	Act	not support the inclusion of RE and EE in the energy matrix	Bahamas Electricity Act -Updated Bahamas Electricity Act		towards the establishment of a National Energy Policy that will promote the incorporation of RE in the energy matrix ▪ Legislators support necessary changes to the Bahamas Electricity Act and the introduction of additional policies and regulations to permit the incorporation of RE in the energy matrix
Component V: Dissemination of findings					
Outcome 5.1: Results of the project are disseminated					
Output 5.1.1: Two Workshops to provide the GoBH officials with capacity and training on EE and RE issues.	-Number of workshops -Number of attendees	-Need for training on RE and EE issues	-2 workshops done to provide training	-Surveys -Workshops results	-Stakeholders show interest in learning about RE and EE measures and benefits
Project management, monitoring , audits and contingencies					

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)

Review Criteria	Questions	Secretariat Comment at PIF/Work Program Inclusion	IDB Comments
Eligibility	1. Is the participating country eligible?	Yes, Bahamas ratified the UNFCCC on 29 March, 1994.	
	2. Has the operational focal point endorsed the project?	Endorsement letter dated October 10,2009 is available from Mr. Philip S. Weech, Director, The Bahamas Environment, Science, and Technology Commission, and GEF Focal Point. Endorsement letter is for a GEF grant of $1,100,000 including agency fees.	
	3. Which GEF Strategic Objective/ Program does the project fit into?	CC SP 1: Promote energy efficiency in residential and commercial buildings CC SP 3: Promote market approaches for RE	
	4. Does the Agency have a comparative advantage for the project?	Yes, as stated in the Council paper GEF/ C.31/ 5 rev.1 on Comparative Advantages - GEF Agencies, IADB has a comparative advantage in this kind of project in the Caribbean region.In addition, the IADB supports the GoBH through MOTE, with additional TA.The combined TA and a possible IADB loan to refinance BEC and support the company's expansion plan with RE, is a very important value added.	
Resource Availability	5. Is the proposed GEF Grant (including available for (if appropriate):		
	The RAF allocation?	Yes.	
	The focal areas?.	Yes	
	Strategic objectives?	N/A	
	Strategic program?	N/A	
Project Design	6. Will the project deliver tangible global environmental benefits?	GEF funding will support the design and implementation of a currently unknown number of pilot projects for energy efficiency and renewable energy. This investment is predicted to promote a certain number of GHG emissions avoided, energy and financial savings, as well as removal of barriers for further investments.Hence, the project will build the capacity for design and implementation (procurement) of EE and RE programs and potentially deliver environment benefits.	
	7. Is the global environmental benefit measurable?		
	8. Is the project design sound, its framework consistent & sufficiently clear (in particular for the outputs)?	Overall, the project design is sound, thematically structured, and some components could even be seen as stand-alone projects.Given that the project has requested no funding for project preparation activities, the baseline and technology assessment activities have been included under the TA parts of component 1 and 2.The parts on investment of component 1 and 2 are well targeted. However, at the PIF stage, no detail has been introduced on their design. It is anticipated that an adequate level of clarification on the design will be introduced in the final project document. Component 3 considers financial refurbishment of the BEC and independent from other components. Component 4 will provide TA to the GoBH on legislation, regulatory and policy issues to adopt EE, RE and WE measures; capacity building for preparation of programs, as well as training of RE technologies technicians and operators.Component 5 focuses on dissemination of findings of the technical	**Please see details of the design in Part II section A**.

		studies and pilot projects, assisting MOTE in identifying interested sectors and developing communications and participation strategies during project preparation and implementation. A component on monitoring and evaluation is introduced together with the project management component. However, given that no GEF funding is requested for this activity, the GEF has no objection to this design.	
	9. Is the project consistent with the recipient country's national priorities and policies?	Yes, the project is consistent with the national priorities and its seven principal areas of strategic focus in the energy sector.	
	10.Is the project consistent and properly coordinated with other related initiatives in the country or in the region?	The project will coordinate with the Organization of American States (OAS) in the Bahamas to ensure that no overlapping work is done within the energy field.	
	11.Is the proposed project likely to be cost-effective?	Cost effectiveness has not been estimated at the PIF stage and will be addressed during the project preparation phase.	**The project is cost effective, obtaining a cost per ton of CO2 reduced of 3.43 US$/tCO2e, a value lower than other GEF project of similar characteristics.**
	12.Has the cost-effectiveness sufficiently been demonstrated in project design?		
	13.Is the project structure sufficiently close to what was presented at PIF?		
	14.Does the project take into account potential major risks, including the consequences of climate change and includes sufficient risk mitigation measures?	The PIF acknowledges risks related to volatility of oil prices, as well as the vulnerability of the GEF pilot projects to extreme weather conditions, i.e. tropical cyclones. The risk affiliated with the oil price risk will be mitigated appropriately, given that the GoBH has endorsed the development and the implementation of the project, regardless of oil price movements. In addition, the project will conduct a study which will come up with solutions to mitigate the potential damages from extreme weather conditions.	
Justification for GEF Grant	15.Is the value-added of GEF involvement in the project clearly demonstrated through incremental reasoning?	Yes, GEF funding will provide substantial financial support (50%) of pilot activities of EE and RE. Without the pilot investments the project would lack a demonstration component which is essential to make a convincing case for switching to RE and EE practices	
	16.How would the proposed project outcomes and global environmental benefits be affected		

	if GEF does not invest?		
	17.Is the GEF funding level of project management budget appropriate?	N/A since no GEF funding is used for project management.	
	18.Is the GEF funding level of other cost items (consultants, travel, etc.) appropriate?		
	19.Is the indicative co-financing adequate for the project?	Yes, co-financing comes from IDB through SECCI and Infrafund. Project grant (000$): 1,000; co-financing (000$):1,812.5; ratio 1:1.81	**The ratio is now 1: 2.6 (see details in Part I Section A).**
	20.Are the confirmed co-financing amounts adequate for each project component?		
	21.Does the proposal include a budgeted M&E Plan that monitors and measures results with indicators and targets?		
Secretariat´s	STAP		
	Convention Secretariat		
	Agencies' response to GEFSEC comments		
	Agencies' response to Council comments		
Secretariat Decisions			
Recommen-dations at PIF	**22. Is PIF clearance being recommended?**	The project is being recommended for PIF clearance.	
	23.Items worth noting at CEO Endorsement.	In the project document please clarify what is meant by "mercury-free CFLs" - please include technical specifications on the mercury content within the CFLs that the project plans to distribute.	**It is important to clarify that the CFLs used in this program will probably not be mercury free. Therefore an Environmental**

			Assessment for the disposal of used CFLs has been prepared and approved by the Environmental and Social Review Unit of the IDB. The report is attached to this project.
Recommen-dation at CEO Endorsement	**24. Is CEO Endorsement being recommended?**		

ANNEX C: CONSULTANTS TO BE HIRED FOR THE PROJECT USING GEF RESOURCES

REGARDING THE SWH PILOT PROJECT:

Position Titles	*$/ person week**	*Estimated person weeks***	*Tasks to be performed*
International			
For Technical Assistance			
International backstopping			
Solar thermal energy engineering senior expert	2,500	8	o Assist PEU in the launch, installations, evaluation, commissioning and start up for SWH systems o Assist PEU in the definition of a targeted capacity building plan o Participate and supervise the capacity building actions (training of plumbers / contractors) o Supervise monitoring data and evaluation reports o Technical support to PEU
Justification for Travel, if any: 2 trips at 4,000 each. Total Travels: 8,000			

* Provide dollar rate per person week. ** Total person weeks needed to carry out the tasks.

REGARDING THE PV PILOT PROJECT:

Position Titles	*$/ person week**	*Estimated person weeks***	*Tasks to be performed*
Technical assistance			
Local			
Engineering assistant	600	30	o Site preparation with stakeholders o Launch, evaluate and commission tender for turn-key installation o Commissioning and start-up o Reporting o Supervise capacity building actions o Execution works monitoring o Periodic monitoring reports o Characterization of the average domestic electricity consumption patterns in the Bahamas
International			
PV solar energy engineering senior expert	2,500	13	o Assist PEU and BEC in the procurement process o Assist PEU in the launch, evaluation and commissioning of applications form o Assist PEU in the net metering design o Define capacity building plan o Participate and supervise the capacity building actions o Prepare training material for capacity building actions o Assist the PMU and BEC during installation works, commissioning and start-up o Supervise monitoring data and evaluation reports o Training and certification of electricians, contractors and BEC staff
Justification for Travel, if any: 2 trips at 4,000 each. Total Travels: 8,000			

* Provide dollar rate per person week. ** Total person weeks needed to carry out the tasks.

ANNEX D: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS

A. EXPLAIN IF THE PPG OBJECTIVE HAS BEEN ACHIEVED THROUGH THE PPG ACTIVITIES UNDERTAKEN.

B. DESCRIBE FINDINGS THAT MIGHT AFFECT THE PROJECT DESIGN OR ANY CONCERNS ON PROJECT IMPLEMENTATION, IF ANY:

C. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES AND THEIR IMPLEMENTATION STATUS IN THE TABLE BELOW:

Project Preparation Activities Approved	*Implementation Status*	*GEF Amount ($)*				*Co-financing ($)*
		Amount Approved	*Amount Spent Todate*	*Amount Committed*	*Uncommitted Amount**	
	(Select)					
Total						

* Any uncommitted amounts should be returned to the GEF Trust Fund. This is not a physical transfer of money, but achieved through reporting and netting out from disbursement request to Trustee. Please indicate expected date of refund transaction to Trustee.

ANNEX E: CALENDAR OF EXPECTED REFLOWS

Provide a calendar of expected reflows to the GEF Trust Fund or to your Agency (and/or revolving fund that will be set up)