



GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET

Naoko Ishii
CEO and Chairperson

April 10, 2018

Mr. Juergen Hierold
GEF Coordinator
United Nations Industrial Development Organization
Vienna International Centre
Vienna, Austria

Dear Mr. Hierold:

I am pleased to inform you that I have approved the medium-sized project detailed below:

Decision Sought:	Medium-sized Project (MSP) Approval
GEFSEC ID:	9648
Agency(ies):	UNIDO
Focal Area:	Climate Change
Project Type:	Medium-Sized Project
Country(ies):	Barbados
Name of Project:	Strategic Platform to Promote Sustainable Energy Technology Innovation, Industrial Development and Entrepreneurship in Barbados
Indicative GEF Project Grant:	\$1,776,484
Indicative Agency Fee:	\$168,766
Funding Source:	GEF Trust Fund

This approval is subject to the comments made by the GEF Secretariat in the attached document. It is also based on the understanding that the project is in conformity with GEF focal areas strategies and in line with GEF policies and procedures.

Sincerely,

Naoko Ishii
Chief Executive Officer and Chairperson

Attachment: GEFSEC Project Review Document
Copy to: Country Operational Focal Point, GEF Agencies, STAP, Trustee



GEF-6 REQUEST FOR PROJECT ENDORSEMENT/APPROVAL

PROJECT TYPE: Medium-sized Project
TYPE OF TRUST FUND: GEF Trust Fund

For more information about GEF, visit TheGEF.org

PART I: PROJECT INFORMATION

Project Title: Strategic platform to promote sustainable energy technology innovation, industrial development and entrepreneurship in Barbados			
Country(ies):	Barbados (with wider regional impacts in the Caribbean)	GEF Project ID: ¹	9648
GEF Agency(ies):	UNIDO	GEF Agency Project ID:	150123
Other Executing Partner(s):	Ministry of Industry, International Business, Commerce and Small Business Development (MIICS), the Barbados Investment and Development Corporation (BIDC) and the Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE)	Submission Date: Resubmission Date:	03/05/2018 03/16/2018 03/28/2018
GEF Focal Area (s):	Climate Change	Project Duration (Months)	48
Integrated Approach Pilot	IAP-Cities <input type="checkbox"/> IAP-Commodities <input type="checkbox"/> IAP-Food Security <input type="checkbox"/>	Corporate Program: SGP <input type="checkbox"/>	
Name of Parent Program	[if applicable]	Agency Fee (\$)	168,766

A. FOCAL AREA STRATEGY FRAMEWORK AND OTHER PROGRAM STRATEGIES²

Focal Area Objectives/Programs	Focal Area Outcomes	Trust Fund	(in \$)	
			GEF Project Financing	Co-financing
CCM-1 Program 1	Outcome A. Accelerated adoption of innovative technologies and management practices for GHG emission reduction and carbon sequestration;	GEFTF	1,776,484	12,910,000
Total project costs			1,776,484	12,910,000

B. PROJECT DESCRIPTION SUMMARY

Project Objective: Enhanced GHG emission reduction and domestic value creation through the strengthening of the sustainable energy and climate technology manufacturing and servicing industry in Barbados						
Project Components/Programs	Financing Type ³	Project Outcomes	Project Outputs	Trust Fund	(in \$)	
					GEF Project Financing	Confirmed Co-financing
1. Policy and Regulatory Framework	TA	1.1 Enhanced market opportunities for sustainable energy and climate technology (SEC) businesses	1.1.1 A dialogue platform to promote sustainable energy and climate innovation, entrepreneurship and	GEFTF	200,000	750,000

¹ Project ID number remains the same as the assigned PIF number.

² When completing Table A, refer to the excerpts on [GEF 6 Results Frameworks for GETF, LDCF and SCCF](#) and [CBIT programming directions](#).

³ Financing type can be either investment or technical assistance.

		through a coherent policy, regulatory and incentive framework and improved public-private coordination	<p>industrial development is fully operational</p> <p>1.1.2 A vision statement and strategy to promote the country as a hub for SEC technologies and services is developed and promoted abroad through various means</p> <p>1.1.3 Annual high-level policy dialogues on sustainable energy and climate industry issues are organized</p> <p>1.1.4 Demand creating and supplier oriented proposals to improve the coherence and effectiveness of policies and legislation are formulated and under implementation</p>			
2. Investment and Business Promotion	Inv	2.1 Increased investments into the domestic sustainable energy servicing and manufacturing industry in technology areas with high GHG emission and value creation potential	<p>2.1.1 A sustainable energy and climate technology cluster hub is created and provides effective services to its expanding member base</p> <p>2.1.2 A dedicated financing facility provides grants and concessional loans for the commercialisation of business ideas and innovations developed in the scope of the cluster</p>	GEFTF	1,000,000	9,900,000
	TA		2.1.3 A business match-maker provides market intelligence and interlinks cluster members with technology companies, investors and venture capitalist in the Caribbean, the diaspora and internationally	GEFTF	100,000	670,000

3. Capacity building and knowledge management	TA	3.1 Enhanced innovation and implementation capacities of sustainable energy businesses in technology areas with high GHG emission reduction and value creation potential	3.1.1 Proposals for improved product, service and qualification standards and certifications are formulated (e.g. PV, solar-thermal buildings, appliances) 3.1.2 One (1) on-line training program on sustainable energy island solutions is developed and applied by educational institutions and experts in Barbados 3.1.3 At least 300 experts from various sectors are trained through national and sub-regional trainings, by train-the-trainer approaches and training mission 3.1.4 At least two R&D partnerships between companies of the cluster and domestic and/or international applied research institutions are created and under execution	GEFTF	264,985	950,000
4. Monitoring and Evaluation	TA	4.1 Project's progress towards objectives continuously monitored and evaluated	4.1.1 Project monitoring and evaluation (incl. mid-term evaluation and final evaluation)	GEFTF	50,000	130,000
Subtotal					1,614,985	12,400,000
Project Management Cost (PMC) ⁴				GEFTF	161,499	510,000
Total project costs					1,776,484	12,910,000

⁴ For GEF Project Financing up to \$2 million, PMC could be up to 10% of the subtotal; above \$2 million, PMC could be up to 5% of the subtotal. PMC should be charged proportionately to focal areas based on focal area project financing amount in Table D below.

C. CONFIRMED SOURCES OF CO-FINANCING FOR THE PROJECT BY NAME AND BY TYPE

Please include evidence for co-financing for the project with this form.

Sources of Co-financing	Name of Co-financier	Type of Cofinancing	Amount (\$)
Recipient Government	Ministry of Industry, International Business, Commerce and Small Business Development (MIICS) ⁵	Grants and in-kind	1,750,000
Recipient Government	Energy and Telecommunications Division at Office of the Prime Minister (DoET) with funding of IADB and EU ⁶	Loans and Grants	4,000,000
Private Sector	Barbados Investment and Development Corporation (BIDC)	Grants	1,000,000
Private Sector	Barbados Investment and Development Corporation (BIDC)	In-kind	4,000,000
Private Sector ⁷	Williams Industries	Equity	250,000
Private Sector	Megapower	Equity	400,000
Private Sector	Aceleron	Equity	250,000
Private Sector	The Barbados Light & Power Company Limited	Equity	\$ to be decided
Private Sector	Barbados Renewable Energy Association	Equity	\$ to be decided
GEF Agency	UNIDO	Grants	55,000
GEF Agency	UNIDO	In-kind	205,000
Others	Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE)	Grants	1,000,000
Total Co-financing			12,910,000

D. TRUST FUND RESOURCES REQUESTED BY AGENCY(IES), COUNTRY(IES), FOCAL AREA AND THE PROGRAMMING OF FUNDS

GEF Agency	Trust Fund	Country Name/Global	Focal Area	Programming of Funds	(in \$)		
					GEF Project Financing (a)	Agency Fee ^{a)} (b) ²	Total (c)=a+b
UNIDO	GEF TF	Barbados	Climate Change	(select as applicable)	1,776,484	168,766	1,945,250
Total Grant Resources					1,776,484	168,766	1,945,250

a) Refer to the Fee Policy for GEF Partner Agencies

⁵ A detailed separation between „grant” and “in-kind” co-financing will be done in the kick-off meeting in partnership with MIICs. It is expected that USD 1,000,000 is a grant-contribution and USD 750,000 is an in-kind contribution.

⁶ The approval process is currently ongoing and requires approval of the GEF co-funding contribution. The co-funding letter will be submitted to the GEF shortly after the approval process of the GEF project.

⁷ Further private sector investments will be leveraged during project implementation through expanding company memberships in the technology cluster and provided support by the entrepreneurship facility in line with the GEF co-financing policy (2014).

E. PROJECT'S TARGET CONTRIBUTIONS TO GLOBAL ENVIRONMENTAL BENEFITS⁸

Provide the expected project targets as appropriate.

Corporate Results	Replenishment Targets	Project Targets
1. Maintain globally significant biodiversity and the ecosystem goods and services that it provides to society	Improved management of landscapes and seascapes covering 300 million hectares	<i>hectares</i>
2. Sustainable land management in production systems (agriculture, rangelands, and forest landscapes)	120 million hectares under sustainable land management	<i>hectares</i>
3. Promotion of collective management of transboundary water systems and implementation of the full range of policy, legal, and institutional reforms and investments contributing to sustainable use and maintenance of ecosystem services	Water-food-ecosystems security and conjunctive management of surface and groundwater in at least 10 freshwater basins;	<i>Number of freshwater basins</i>
	20% of globally over-exploited fisheries (by volume) moved to more sustainable levels	<i>Percent of fisheries, by volume</i>
4. Support to transformational shifts towards a low-emission and resilient development path	750 million tons of CO _{2e} mitigated (include both direct and indirect)	82,000 metric tons of CO _{2e} direct emission reduction over the project duration of 4 years. 3.2 million metric tons of CO _{2e} indirect emission reduction over the next 20 years.
5. Increase in phase-out, disposal and reduction of releases of POPs, ODS, mercury and other chemicals of global concern	Disposal of 80,000 tons of POPs (PCB, obsolete pesticides)	<i>metric tons</i>
	Reduction of 1000 tons of Mercury	<i>metric tons</i>
	Phase-out of 303.44 tons of ODP (HCFC)	<i>ODP tons</i>
6. Enhance capacity of countries to implement MEAs (multilateral environmental agreements) and mainstream into national and sub-national policy, planning financial and legal frameworks	Development and sectoral planning frameworks integrate measurable targets drawn from the MEAs in at least 10 countries	<i>Number of Countries:</i>
	Functional environmental information systems are established to support decision-making in at least 10 countries	<i>Number of Countries:</i>

F. DOES THE PROJECT INCLUDE A “NON-GRANT” INSTRUMENT? No

(If non-grant instruments are used, provide an indicative calendar of expected reflows to your Agency and to the GEF/LDCF/SCCF/CBIT Trust Fund) in Annex D.

⁸ Update the applicable indicators provided at PIF stage. Progress in programming against these targets for the projects per the *Corporate Results Framework* in the [GEF-6 Programming Directions](#), will be aggregated and reported during mid-term and at the conclusion of the replenishment period.

PART II: PROJECT JUSTIFICATION

A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN WITH THE ORIGINAL PIF⁹

The project baseline and project design has not changed significantly since the PIF submission. The results of the undertaken Sustainable Energy Industry Market Assessment (SEIMA) and the Pre-feasibility Study on the proposed Sustainable Energy and Climate Technology Cluster were incorporated into the CEO Endorsement. In over twenty-five (25) bilateral meetings and two (2) workshops with over forty (40) participants each, the main stakeholders were first interviewed about their needs and expectations and then introduced to different technology cluster designs. A survey with key questions was conducted. The proposed activities under the three project components were more detailed and an effective execution strategy for the project was developed. The detailed changes made are outlined in the table below:

Components and outputs at PIF stage		Components and outputs at CEO endorsement stage	
Project Outcome	Expected Outputs	Project Outcome	Expected Outputs
1.1 Empowerment of innovative domestic sustainable energy entrepreneurs through enhanced institutional coordination and targeted support	<p>1.1.1. A strategic platform to promote sustainable energy entrepreneurship, innovation and industrial development in priority technology areas with high GHG emission reduction and value creation potential is fully operational</p> <p>1.1.2 Based on a market assessment a strategy to promote entrepreneurship and innovation in technology areas with high GHG emission reduction and value creation potential is adopted and under execution</p>	1.1 Enhanced market opportunities for SEC businesses through a coherent policy, regulatory and incentive framework and improved public-private coordination	<p>1.1.1 A dialogue platform to promote sustainable energy and climate innovation, entrepreneurship and industrial development is fully operational</p> <p>1.1.2 A vision statement and strategy to promote the country as a hub for SEC technologies and services is developed and promoted abroad through various means</p> <p>1.1.3 Annual high-level policy dialogues on sustainable energy and climate industry issues are organized</p> <p>1.1.4 Demand creating and supplier oriented proposals to improve the coherence and effectiveness of policies and legislation are formulated and under implementation</p>
1.2 New market opportunities for innovative domestic sustainable energy entrepreneurs through improved policy and incentive frameworks	1.2.1. Coherent demand and supplier oriented policy proposals to disseminate innovative technology solutions across all relevant sectors (e.g. tourism, agro-business, fishery, manufacturing industry, buildings) are implemented		

⁹ For questions A.1 –A.7 in Part II, if there are no changes since PIF , no need to respond, please enter “NA” after the respective question.

<p>2.1 Expanding investments in the domestic sustainable energy manufacturing and servicing industry in key technology areas with high GHG emission reduction and value creation potential</p>	<p>2.1.1. Based on a feasibility study, a sustainable energy industry cluster or technology park is established in partnership with the private sector and investors</p> <p>2.1.2 Based on existing instrument a private-sector innovation fund is created and provides continued finance and mentoring to entrepreneurs and start-ups in the identified priority technology areas</p>	<p>2.1 Increased investments into the domestic sustainable energy servicing and manufacturing industry in technology areas with high GHG emission and value creation potential</p>	<p>2.1.1 A sustainable energy and climate technology cluster hub is created and provides effective services to its expanding member base</p> <p>2.1.2 A dedicated financing facility provides grants and concessional loans for the commercialisation of business ideas and innovations developed in the scope of the cluster</p> <p>2.1.3 A business match-maker provides market intelligence and interlinks cluster members with technology companies, investors and venture capitalist in the Caribbean, the diaspora and internationally</p>
<p>2.2 Improved access of sustainable energy entrepreneurs to regional and international know-how and finance</p>	<p>2.2.1 A business and communication platform interlinks sustainable energy entrepreneurs (and other key actors of the innovation chain) systematically with entrepreneurs, investors, venture capitalists, financiers on other islands, the international level and the diaspora</p> <p>2.2.2 A “go international” initiative managed by CCREEE will contribute to the dissemination of new technology solutions with high GHG emission reduction potential in the Caribbean</p>		
<p>3.1 Enhanced quality, innovation and capacity building frameworks for domestic sustainable energy entrepreneurs</p>	<p>3.1.1 Existing R&D funding streams for public/private applied research institutions will be strengthened in the context of the identified priority technology areas with high GHG emission reduction potential</p> <p>3.1.2 A framework for certification, qualification and accreditation of sustainable energy</p>	<p>3.1 Enhanced innovation and implementation capacities of sustainable energy businesses in technology areas with high GHG emission reduction and value creation potential</p>	<p>3.1.1 Proposals for improved product, service and qualification standards and certifications are formulated (e.g. PV, solar-thermal buildings, appliances)</p> <p>3.1.2 One (1) on-line training program on sustainable energy island solutions is developed and applied by educational institutions and experts in Barbados</p> <p>3.1.3 At least 300 experts from various sectors are trained through</p>

	<p>products and services is developed and a hub for its implementation is created</p> <p>3.1.3 More than 200 entrepreneurs are trained through national and regional train the trainer approaches facilitated by CCREEE in partnership with various institutions</p>		<p>national and sub-regional trainings, by train-the-trainer approaches and training missions</p> <p>3.1.4 At least two R&D partnerships between companies of the cluster and domestic and/or international applied research institutions are created and under execution</p>
<p>4.1. Adequate and systematic monitoring of all project indicators (incl. gender) together with regular and comprehensive assessment of an on-going and / or completed activities to ensure successful project implementation</p>	<p>4.1.1. At least one annual meeting of the Project Steering Committee</p> <p>4.1.2. Annual progress reports in accordance with the established monitoring plan</p> <p>4.1.3. Mid-term review and terminal project evaluation conducted</p>	<p>4.1 Project's progress towards objectives continuously monitored and evaluated</p>	<p>4.1.1 Project monitoring and evaluation (incl. annual progress reports with monitoring plan, mid-term review and final project evaluation)</p>

A.1. Project Description.

A.1.1 The global environmental and/or adaptation problems, root causes and barriers

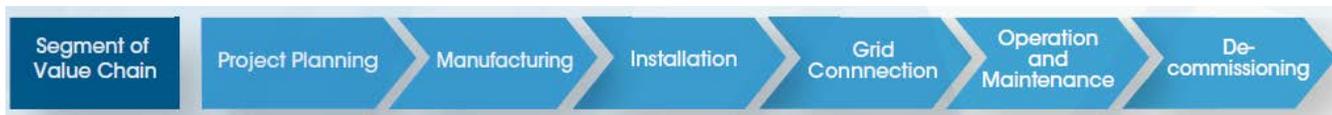
According to the Fifth Assessment Report of the International Panel for Climate Change (IPCC AR5), the atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. Carbon dioxide concentrations have increased by 40% since preindustrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions. These emissions will continue to grow over the next few decades if climate change mitigation efforts are not accelerated.

In line with the Paris Climate Agreement and the Sustainable Development Goals (SDGs), most developing countries have introduced ambitious targets to reduce GHG emissions by scaling-up renewable energy (RE) and energy efficiency (EE) investments throughout the next two decades. However, the further dissemination and usage of these technologies is hindered by a broad range of interrelated barriers (e.g. policy, technical, financial, institutional, capacity, knowledge, awareness) which need to be addressed by Governments.

In many developing countries the inability of the private sector to supply sustainable energy quality products and services under competitive prices has become a major bottleneck. Often the domestic manufacturing and servicing sector is weakly developed and the market demand remains underserved by international suppliers and supply chains due to high market entry costs and risks. This situation has led to a mismatch between the increasing demands for specialized services and equipment on the one hand and the limited capacities of the domestic private sector to meet them. Despite enabling policies and targets this leads in some cases to a stagnating market where sustainable energy investments occur only ad-hoc and without the perspective of scaling-up. The lack of viable business, operation and maintenance models is questioning the long-term sustainability of decentralized RE projects in various developing countries (e.g. mini-grids in SIDS or Sub-Saharan Africa).

In many developing countries this has also led to a trend where the domestic value and job creation effects along the value chain of sustainable energy investments (manufacturing and distribution, project planning and development, construction and installation, operation and maintenance, decommissioning and recycling) remain very limited. Basic equipment and services (e.g. consulting, energy auditing, installation, maintenance) continue to be imported from outside. The absence of innovation, qualification and certification frameworks hinders the development and introduction of innovative technology solutions and services with high GHG emission reduction and local value creation potential.

Figure 1: Typical segments of the renewable energy value chain



Transformational sustainable energy and climate policies combine demand and supplier oriented elements smartly together. However, in many cases sustainable energy policies just focus on demand creation and do not consider supplier oriented elements to promote private sector development simultaneously. Demand-oriented policies establish fiscal and non-fiscal incentives to stimulate the demand for sustainable energy services and products (e.g. targets, feed-in-tariffs, quotas, investment subsidies, grants and loans with reduced interest rates, green public procurement, energy efficient building codes).

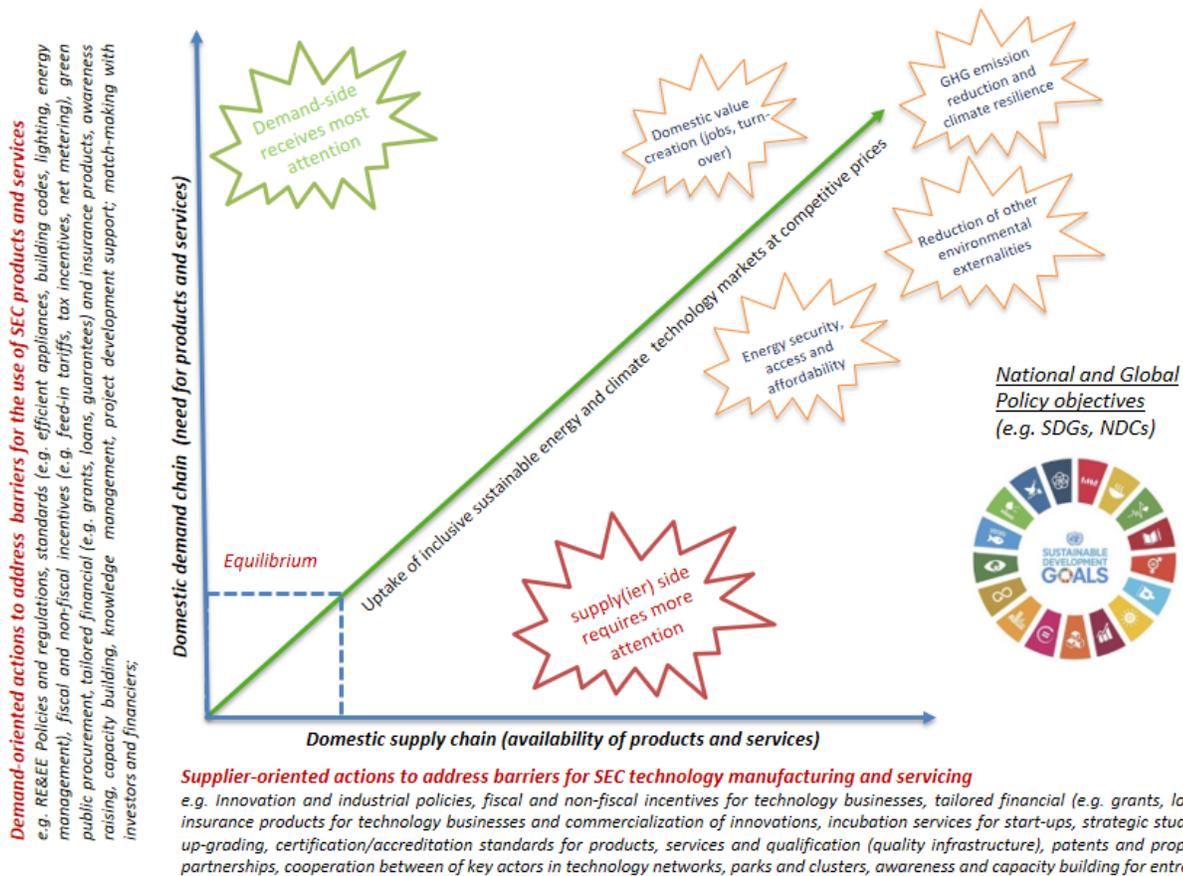
On the other hand, supply(ier) side policies are very specific and target either a particular sector or firm. They can include selected measures regarding investment support, establishing discussion platforms, selective educational curriculums, as well as mandatory training in a special technology or activity. They range from protective

instruments and interventions addressing market failures to creating a stimulating economic framework for selected firms or sectors/technologies (e.g. clusters, technology parks, R&D, grants or tax relief for certain production processes).

Also, in Barbados the envisaged sustainable energy transformation is facing manifold barriers. Apart from other constraints, the weak capacities of the domestic private sector to supply RE and EE quality products and services has become a significant bottleneck. This was confirmed by the stakeholder consultations undertaken during the PPG phase. Various experts and institutions emphasized that the limited capacities of domestic entrepreneurs to develop, plan, install and maintain new technologies have become a major barrier for the implementation and sustainability of sustainable energy promotion programs.

Moreover, there is the impression that due to the high import intensity some technologies are not creating the local added value as they could do. This has introduced an additional acceptance barrier for the uptake of the market. It becomes clear, that without the urgent strengthening of the domestic absorption and innovation capacities of the private sector the country will not attain its sustainable energy and climate mitigation targets. The key barriers for the sustainable energy manufacturing and servicing industry are further explained in the baseline section of the CEO Endorsement Document.

Figure 2: UNIDO theory of change: The uptake of inclusive sustainable energy and climate technology markets in developing countries requires equal emphasis on demand- and supply-side actions



The GEF project is fully in line with the mandate of UNIDO to promote inclusive and sustainable industrial development (ISID). UNIDO has a long-standing track-record in the areas of value chain and SME development as well as cluster and quality infrastructure. The expertise ranges from agrobusiness to the pharmaceutical or the automobile sector. Also, in the energy sector, UNIDO is assisting developing countries in promoting sustainable energy entrepreneurship, innovation and industrial development. The promotion of RESCOs, ESCOs and domestic manufacturing/assembly is an important element of the industrial EE and RE program of UNIDO.

With this approach, UNIDO addresses a major growth barrier for sustainable energy markets, reduces negative environmental externalities (GHG, local pollution) and promotes value and job creation simultaneously. In many regions, the sustainable energy and climate sector is considered as a future growth sector, which offers business and employment opportunities particularly for small and medium sized enterprises (SMEs). SMEs create jobs and are essential for the overall development of the economy, accounting for 99% of the number of businesses worldwide. This is particularly true for small island developing states (SIDS).

A.1.2. Baseline scenario and any associated baseline projects

Country Context

Small Island Developing States (SIDS) face economic and environmental challenges as they intend to use their limited energy resources in the most prudent and efficient possible manner. Prices of electricity are generally higher than those for countries that are connected to a continental land mass. This is because islands offer little or no opportunity to interact with other electricity grids, and there needs to be a greater amount of capacity reserved on islands to be able to compensate it. Barbados, a country-island of 431 square kilometres and a population of approximately 287,000 (2015), ranks high among Latin America and the Caribbean (LAC) countries in terms of social and economic indicators.

➔ Since 1990, Barbados has been ranked in the Human Development Index (HDI) among the top 50 countries in the world. However, as a SIDS, Barbados faces special challenges in relation to its small size, remoteness from large markets, lack of resources, heavy dependence on imports, a significant trade deficit, and high dependence on a small number of economic sectors, direct investment and remittances inflow. Moreover, the country demonstrates a high dependence on expensive fossil fuel imports and economic key sectors are highly vulnerable to external economic, natural and climate shocks. The country, as an island state, is also particularly vulnerable to climate change impacts, which can cause impacts such as erosion of coastlines, contamination of ground water, damage to coral reefs and more severe hurricanes and storms.

➔ *Barbadian Energy snapshot:*

Barbados is facing the challenges of energy security, energy affordability and climate mitigation/adaptation simultaneously. Approximately 90% of the electricity produced is generated from fossil fuel oil. This dependency affects the Barbadian economy negatively at both the macroeconomic and consumer levels. Fuel imports represent a significant expenditure and drain on Barbados' foreign reserves, particularly considering the high degree of volatility in international oil markets. According to the Government of Barbados (GoB), the fuel import bill (approximately 6% of Barbados' GDP) is equivalent to Barbados' expenditures on education. According to the Barbados Statistical Services (BSS), the country spent US\$427 million in fuel retained imports in 2014.

The dependence on fossil fuels and high electricity prices is jeopardizing the productivity and competitiveness of Barbadian companies and industry. Power generation in Barbados depends highly on heavy fuel oil (HFO) which accounts for 54% of fossil fuel use in the country. HFO powers almost all of the electric utility's generation capacity. Barbados Light and Power (BL&P), a private entity and the sole utility in Barbados, has an installed electric capacity of 239 MW. BL&P, is owned by EMERA, a Canadian company and it is regulated by the Fair Trading Commission (FTC). Barbados' power generation fleet relies mainly on low speed diesel generators which

operate on Heavy fuel oil, Bunker "C". The cost of electricity fluctuates monthly through the application of the fuel clause adjustment. In cooperation with the utility, the Government is supporting a transformational shift towards more sustainable fuels and technologies such as Liquefied Natural Gas (LNG), RE and EE.

In terms of indigenous energy resources, Barbados has significant untapped solar, wind and bioenergy, as well as EE potential. The country also has a small amount of oil and gas resources which are produced on the island and refined in the neighbouring island state of Trinidad and Tobago. The majority of fossil fuels used on the island are imported from Trinidad and Tobago. Without large-scale mainstreaming of RE and EE solutions into key sectors of the economy (generation and distribution of power and energy services, construction, fisheries and agro-processing, tourism, transport, waste management, as well as water/desalination), the sustainable development, energy and climate mitigation targets of the country will not be attained. In the power sector, Barbados has opportunities to increase the RE share considerably during the next 10 years. Approximately 104.5 MW of existing BL&P generating capacity is scheduled for retirement over the next ten years and electricity demand is expected to grow by an average of around 1.2% per year.

In parallel, the sustainable energy investments in the Caribbean Community (CARICOM) are growing. CARICOM has taken major steps to mainstream RE and EE into its regional policies, programs and activities. The Forty-First Special Meeting of the Council for Trade and Economic Development (COTED) on Energy held in March 2013 approved the CARICOM Energy Policy and the Caribbean Sustainable Energy Roadmap and Strategy (C-SERMS). The latter aims to increase the RE penetration in the electricity sector to 20% by 2017, 28% by 2022 and 47% by 2027. The CARICOM efforts resulted also in the creation of the UNIDO supported Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE) in 2016 with its Secretariat based in Bridgetown, Barbados.

→ *Barbadian Economy snapshot:*

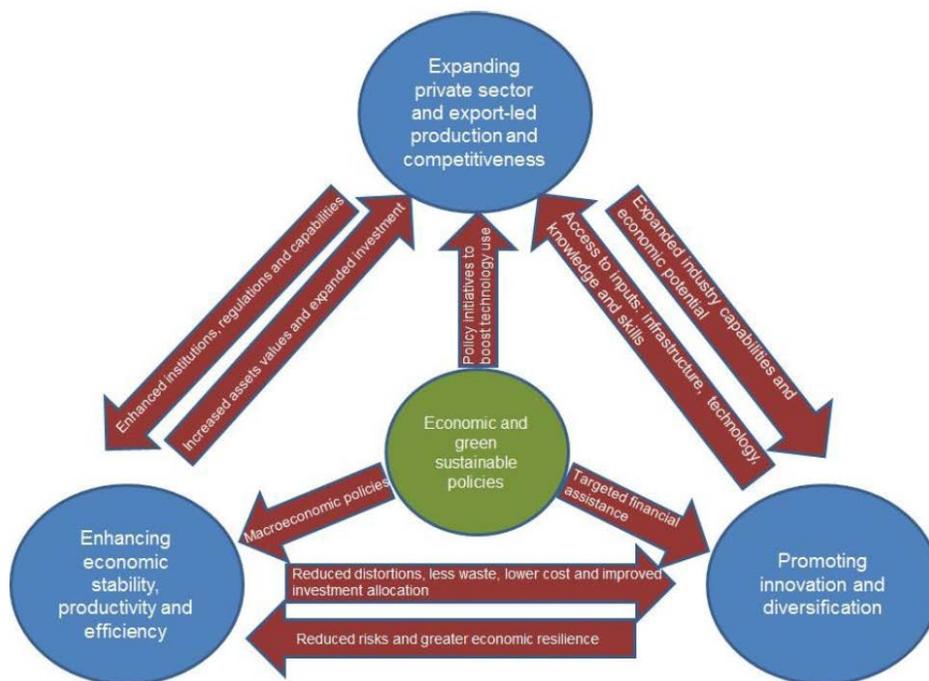
The GEF project is fully embedded in the current policy and strategy framework of Barbados. Barbados maintains an open, well-regulated and transparent environment for doing business, with high-quality institutions. The country's government effectiveness ranking in the World Bank's Worldwide Governance Indicators is among the highest for SIDS. However, the economy is currently recovering from the negative impacts of the recent global financial and economic crisis and is undergoing a general transformation. The economy has been almost stagnant over the past two decades, with growth averaging just 1.4% per year between 1995 and 2013. The slowdown in domestic and international economic growth has significantly weakened demand for most domestic businesses. The government's fiscal accounts have deteriorated fairly sharply, and there has been a consequent rapid increase in public-sector debt.

Tourism is the main driver of activity in the services sector, accounting for roughly three-quarters of services exports. The strong contribution of services to the economy is in part a reflection of a decline in the fortunes of agriculture (notably the sugarcane industry) and manufacturing. Despite isolated successes, the Barbadian manufacturing sector has failed to move up the value-chain. Industrial production in Barbados today consists largely of petroleum products, food, and beverages, printing and fabricated metal products. In most instances, these industries largely supply the domestic market, but some firms also sell into the export market. Similarly, the sugar business is shrinking over decades. The industry has failed to find a viable long-term strategy with the cessation of European Union's price support mechanism.

The private sector has traditionally been the main source of jobs in Barbados. At the end of 2013 approximately 93% of the labour force, or 126,200 people, worked in the private sector, according to the BSS. Most firms operating in the domestic market can be classified as small—that is, having fewer than 20 employees. Barbados faces a high rate of unemployment. Of a total labour force of 142,900, unemployment reached 11.7% in 2013, up from 7.4% in 2007, and is a particular issue among those workers aged 25-44 years.

As a reaction to the economic difficulties, the Government has introduced a bundle of forward-looking policies which aim to address the economic, social and environmental challenges simultaneously and seek a further diversification of the export base and competitiveness of the economy. In the National Strategic Plan 2005-2025, the Government has set the goal of becoming a “green circular economy” and the “most environmentally advanced green country in Latin America and the Caribbean”. The adopted Medium-Term Growth and Development Strategy 2013-2020 targets a return of the Barbadian economy to its historic growth rate of between 3.0 by 2018 and to 4.0 per cent by 2020.

Figure 3: Macro-Growth and development model of Barbados (GoB)



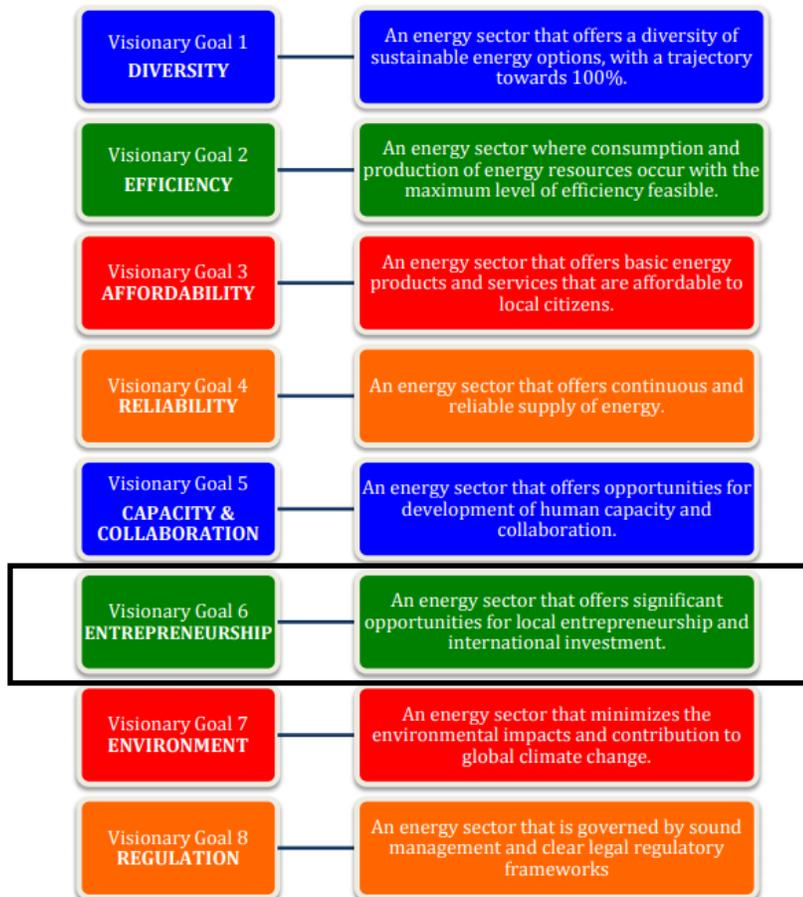
The macro-growth and development model of the strategy combines targeted interventions to expand private sector and export-led production and competitiveness, to promote innovation and diversification and to enhance economic stability, productivity and efficiency. The model lays special emphasis on diversifying the economy through the strengthening of small and medium sized (SMEs) manufacturing and servicing companies and promoting technology innovation. Apart from tourism, international business, financial services, alcoholic beverages and education, the Private Sector Assessment of Barbados (2013) has identified “green energy” as a promising growth sector.

Baseline scenario (i.e. situation in the country should no intervention of GEF take place)

In line with the current economic growth policy and at the backdrop of several oil price peaks and fluctuations since 2008, Barbados has increased also its efforts through the introduction of enabling sustainable energy policies and regulatory frameworks. The GEF project will contribute to the implementation of energy and climate related key policies of the Government. In November 2017, the Division of Energy and Telecommunications (DoET) finalized the new Barbados National Energy Policy 2017-2017 (BNEP) which sets a 56% RE power production target by 2032 and a 75% target by 2037. The GEF project will contribute particularly to the attainment of „Vision Goal 6: Entrepreneurship” of the policy. MIICS and UNIDO will provide inputs to the BNEP implementation plan to be developed in the upcoming months. The GEF project will also contribute to the Barbados Nationally Determined Contribution (NDC) which adopted an economy-wide GHG reduction objective of 23% by 2030 compared with the baseline year 2008. In the reference year, energy accounted to around 72% of the overall GHG

emissions. In parallel, the local utility Barbados Light & Power (BL&P) has committed to a „100/100 vision” which works towards 100% RE and 100% electrification (incl. transport) by 2045.

Figure 4: Summary Table of Vision Statement and Visionary Goals of BNEP

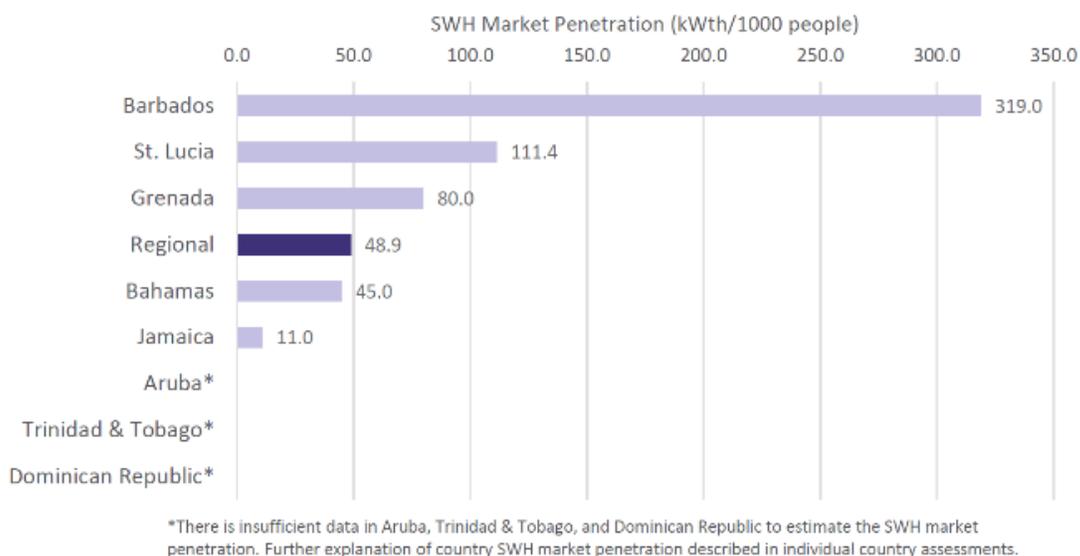


→ Existing sustainable energy industry

Barbados has already a small sustainable energy manufacturing and servicing industry which comprises mainly SMEs in the areas of solar-thermal (SWH), PV, LED lighting and electric vehicles. The Sustainable Energy Industry Market Assessment estimates the current employment in the sustainable energy industry at about 200 full time equivalents (FTE).

Since the 1970s the country succeeded in establishing an export-oriented solar-thermal manufacturing and servicing industry. Barbados has been a Caribbean leader in the manufacturing, sale, and use of solar water heaters. Locally Manufactured SWH systems account for all of the residential SWH market in Barbados. There are currently two local manufacturers (SolarDynamics and Sunpower) that produce solar thermal systems for domestic hot water systems. It is estimated that solar water heaters have reached a penetration of 60% in high and middle-income households. Currently, there are approximately 40,000 solar water heaters in Barbados, with more than 30,000 domestic installations. In Barbados the total solar thermal capacity installed was 142 MW_{th} in 2015, according to IEA-SHC. In terms of relative figures (kW_{th} per 1,000 inhabitants) Barbados was still leading with 489, followed by Austria (421) and Cyprus (400) in 2015.

Figure 5: SWH market penetration in selected Caribbean Countries



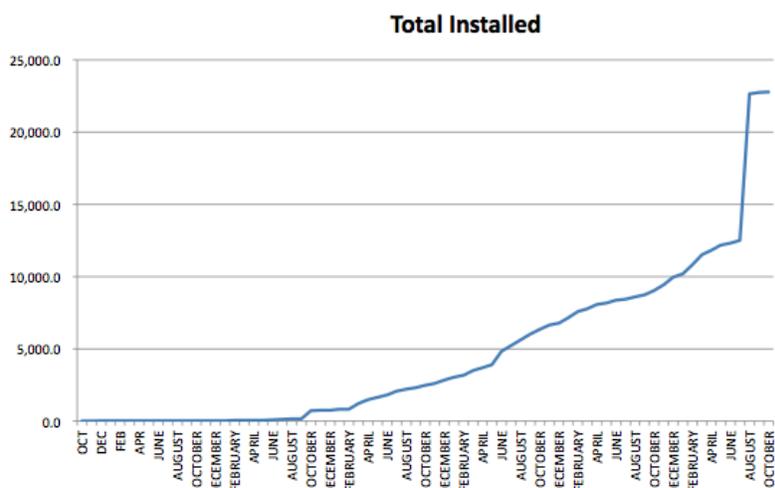
However, the domestic solar-thermal industry (currently comprising two companies) is at a crossroads. Due to the small market size and limited export and innovation capacities, the turnover of the industry remains limited and mainly originates from the stagnating small-scale solar-thermal household sector. The market of medium-scale and more complex heating and/or cooling systems for large-scale consumers in the private and public sector (e.g. tourism, beverage and food processing sector, health care, airport, office buildings) is currently untapped. The same is true for the low-income housing sector.

There is still considerable potential for solar-thermal in the Caribbean. Despite the favorable economic and climatic conditions, the SWH market in the Caribbean is still emerging. Average per capita deployment is relatively low, estimated at 48.9 kW_{th}/1000 people compared to the market leader of Austria at 430 kW_{th}/1,000 people. However, this regional average is skewed by the high levels of SWH deployment in Barbados (319 kW_{th}/1000 people), Saint Lucia (111.4 kW_{th}/1000 people), and Grenada (80.0 kW_{th}/1000 people). Since the late 1990s Solar Dynamics has expanded to own manufacturing operations in Saint Lucia, a distribution centre in Jamaica and agents in the Bahamas, Belize, Dominica, Grenada, Guyana, St. Maarten, St. Vincent & the Grenadines, St. Kitts & Nevis and the British Virgin Islands.

Utility-scale and decentralized PV is likely to become the most significant contributor to the renewable electricity mix. PV is seen as having a strong potential for development in the Barbados market due to the ease with which it can be integrated in areas such as electric vehicles, construction in sustainable and hurricane resilient roofs, and battery storage systems being developed by BL&P. However, so far, the local added value is mainly limited to the installation and no domestic assembling or manufacturing capacities are currently in existence. There are recent discussions on a PV assembling plant which could materialize in the scope of the GEF project.

BL&P demonstrated its recent commitment towards RE through the commissioning of a 10 MW PV plant at Trens, St. Lucy and the envisaged installation of a 5 MW storage system. Some local solar water heating companies have ventured into the PV business. However, generally those companies have remained in their core areas of solar thermal. Solaris, previously Aqua Sol, made the switch to include PV in their business, but they are no longer in business. The main local company that has sought to build a PV business is Williams Industries. Williams Ind. has built on its competencies in electrical installation to develop solar PV installations on most of its office buildings. At the moment, Williams Ind. has combined 3 MW of installed systems, which is the highest capacity of any PV installer in Barbados.

Figure 6: Solar PV Installed Capacity (in kw) in Barbados (2010-2016)



The PV industry business was strongly incentivized through the introduction of the Renewable Energy Rider, proposed by BL&P and approved by the Fair-Trading Commission (FTC) in 2010. Net metering has been allowed in Barbados since 2010, and consumers with wind and/or solar self-generation facilities have been able to supply electricity to the national grid. In February 2015, the program limit was raised from 5 MW to 20 MW. By May 2015 around 8 MW of distributed solar PV had been installed.

Barbados once had the second highest number of windmills per square mile in the world, second only to the Netherlands which is known as the world's famous "Windmill Country". Barbados has an involvement in wind energy going back to the 1980s. A single turbine developed by the local utility BL&P was unfortunately plagued with a myriad of difficulties in approvals and land issues. BL&P develops a wind farm in Lamberts. However, the project faces problems of public acceptance and land availability. . In spite of this, there are a few wind energy projects and individual wind turbines for domestic use that can be spotted across the island. Several entrepreneurs have undertaken efforts to establish local manufacturing capacities for small scale wind turbines.

Barbados is an island pioneer regarding electric vehicles and storage solutions. MEGAPOWER is a privately-owned company, with a female founder and CEO. The company is four years old and promotes and sells electric vehicles (EV) powered by renewables (PV charging network). It links its sale and maintenance of EVs to the expansion of charging facilities including rooftop solar PV. MEGAPOWER manages a solar carport, which can charge eight vehicles, at Regus in Welches. So far, MEGAPOWER has sold 220 electric vehicles. The business expects to continue to grow. Barbados has one of the densest road networks in the hemisphere. The business is currently active in other countries beyond Barbados: Antigua, Grenada, St. Vincent and the Grenadines, Dominica, the Bahamas, Turks and Caicos and Trinidad and Tobago. Opportunities for more market niche areas include public service vehicles and fleets, smart grid technology and battery storage and battery repurposing.

Acleron Ltd is cofounded by a Barbadian and is a cleantech start-up company seeking to revolutionize access to low-cost energy storage. It is currently under establishment and provides an alternative to lithium ion and lead acid batteries. It provides two main services: testing and grading of batteries for tests and grading of batteries for reuse. Their activities help to reduce the waste battery burden on battery sorters/collectors; and offer a modular battery assembly hardware (patent pending) that allows for the serviceable battery concept. At the end of 2017, Acleron established a Barbadian subsidiary and applied for funding from several international facilities. Acleron and MEGAPOWER are developing a close collaborative effort on battery storage/after-use options particularly for EV batteries. One of the biggest post-purchase of the EVs is the battery replacement. Halving that cost would contribute significantly to make EVs more affordable to the average Barbadian consumer.

Caribbean LED Lighting¹⁰ or CLL was established in Barbados in 2011 in parallel to the demand-creating LED lighting programs of the Government. Its primary activity is light manufacturing/assembly of commercial, industrial and residential LED lighting. As regional specialist in LED lighting they also export to 16 countries. CLL has experienced consistent growth and is considered one of the fastest growing companies in the Caribbean. CLL has offices and staff based in St. Lucia and distributors in Trinidad & Tobago, St. Vincent, Antigua, Guyana, St. Kitts & Nevis, Grenada, Turks & Caicos, Dominica and Jamaica. In 2013, CLL also won the Compete Caribbean Innovation Award for their off-grid renewable energy (RE) system called WinSun, the first time that a Barbadian company had ever done so. CLL also offers services such as comprehensive energy audits with LEED practitioners, lighting audit/surveys and environmental protection in the form of secure disposal of fluorescent lights. CLL claims that 70 % value is added in Barbados in assembling its lighting fixtures.

During the 1980's and early 1990's the national utility, purchased electricity produced from bagasse during the sugar crop season by a number of local factories acting as industrial prosumers of RE. However, these arrangements are not in existence anymore and the sugar sector is declining steadily. With the involvement of NGOs that promote gender equality and women's empowerment, there are some efforts to establish a viable business with small-scale biogas systems for rural homes and agricultural activities.

→ Business as usual (BAU) scenario

Despite these promising and pioneering developments, the sector has not reached the needed economies of scales and is facing various barriers for a further uptake. There is only a very small number of suppliers and businesses in the market. Most of the domestic industrial activities are limited to services (e.g. installation, design) and only a few assembling/manufacturing businesses are ongoing. In some traditional sectors the industry seems to have lost its initial innovation capacity (e.g. solar thermal). There is a lack of capacities in some promising growth areas (e.g. energy efficient and climate (hurricane) resilient buildings and appliances, solar-thermal cooling). The small market, high cost of labour and shipping costs (40% higher than in Trinidad and Tabago) remain a limiting factor.

In the Business as Usual (BAU) scenario the uptake of RE and EE investments in Barbados will continue to be hindered by the weak innovation and productive capacity of the local sustainable energy industry. Under this scenario, the attainment of the set sustainable energy, climate and green economy objectives would remain very uncertain. This would jeopardize the vision of the Government to transform into a green circular economy. The local value and job creation effects along the value chain of sustainable energy investments would remain limited. Equipment and services would continue to be imported.

Technology innovations with high GHG emission reduction potential would be hardly developed and available on the market. Moreover, the Barbadian industry would hardly take advantage of the growing sustainable energy market in the Caribbean and would not contribute to its further uptake through innovative island solutions. To move the agenda forward, there is need for a critical mass of innovative export-oriented entrepreneurs, companies and private sector groups.

To attain the established sustainable energy and climate mitigation targets in the National Energy Policy (2017-2037) and the Nationally Determined Contribution (NDC), the Government needs to strengthen the private sector and address existing barriers. The SEIMA identified the following key constraints for private sector development and innovation in the sustainable energy and climate sector:

(1) Lack of coherent policies, strategic steering and institutional coordination

This is an important piece of the puzzle. Throughout the discussions during the PPG phase, many private sector players in established and emerging markets, have expressed hesitancy because of the lack of certainty that current policies and regulations provide. The Government's recent activity in developing the National Renewable Energy

¹⁰ <http://caribbeanledlighting.com/>

Policy (NREP) has helped to some extent, but there is still a lot of work to be done, to make sure that emerging legislation and regulation is conducive to the attainment of the vision and visionary goals set out.

The country has already introduced a number of policies, fiscal and non-fiscal incentives to promote sustainable energy. However, during the PPG consultations many private sector experts expressed the need for more coherent policies and a better consideration of domestic private sector participation. To achieve the set climate mitigation targets, sustainable energy options need to be considered systematically in key industries of the island (generation and distribution of power and energy services, construction, fisheries and agro-processing, tourism, transport, waste management, as well as water/desalination). To ensure local value creation along the life-cycle of sustainable energy investments, demand creating policies and incentives need to be more closely combined with supplier oriented elements. A better link between local value creation and “green public procurement” was suggested. With a budget of approximately 20% of the GDP of the island, the Government is by far the single largest purchaser of goods and services on the island.

A clear demand for improved policy coherence (e.g. energy, industrial, human resource, research, innovation and export policies, regulations and support instruments) was identified. Contradictions between existing policies and fiscal incentives and tax regimes lead to more businesses leaving the market. Some experts highlighted specific regulations and pieces of legislation which seem to work against each other. Some tax concessions for importing energy appliances from overseas have inhibited the development of local markets. For example, there are contradictive fiscal incentives that hinder the use of solar thermal and LED lighting in the hotel industry and low-income housing. Hotels and low-income families continue to use electric heaters. Similar bottlenecks were identified regarding the promotion of electric vehicles (EVs). This limits the opportunities of existing local manufacturers and suppliers in these areas.

Some specific requirements of the Renewable Energy Rider (RER) seem to prohibit consumers and suppliers to take full economic advantage of PV solar home systems. The „buy all- sell all” principle was mentioned in this context. In the early days of the implementation of the RER, there was significant investment by companies in installing RE systems in the country, particularly in the area of solar PVs. The RER was tied to the fuel clause adjustment and given that the price of oil at that time was high, the price for selling electricity to the grid through RE was attractive. However, over the last years the decline in oil prices has reduced the investment and many have left the market. Members of the industry and the local electric utility have made representation to the Fair-Trading Commission (FTC), and a temporary rate of 41.6 BBD cents/ kWh has been set by the FTC. Some wind power developers experienced issues related to regulation and planning permissions. There is still considerable resistance to the installation of large wind turbines in the general public. There is generally limited land space available for the development of wind turbines.

The lack of standards in certain sectors limits opportunities for sustainable energy solutions with high GHG emission and value creation potential. For example, one of the barriers for energy efficient buildings in Barbados is regulatory. There are no mandatory EE standards for buildings, including energy performance assessments (e.g. energy passports for different types of buildings) in force. The building code is not focusing on aspects such as passive cooling, EE and general ‘green building’ solutions. In general, there are problems to enforce building codes. Mandatory labelling standards for energy efficient appliances are still to be enforced or lag behind the latest private sector innovations (e.g. promotion of fluorescents light bulbs (and no incentives for LEDs)). Currently, no organization or company has implemented an energy management system according to ISO 50001.

Also, the lack of national quality standards and certifications for sustainable energy products and services was mentioned as a barrier and limiting factor for market opportunities in Barbados and the wider Caribbean. Without standards and certifications, it is difficult to assure quality of services and products within the sector. This barrier will need to be addressed either by developing indigenous programs for standards or adopting international standards. For example, Barbados has not established national solar thermal water heating standards, certifications or testing procedures, nor has it adopted international standards, certifications or testing procedures. Both existing

solar thermal manufacturers have tested their products for energy performance at the Florida Solar Energy Center (FSEC). Currently none have a Quality Certificate like “Solar Keymark”. In the Caribbean, such quality labels are currently neither introduced to the market nor a requirement for any financial incentive scheme, with the exception of the French Caribbean Islands, where the Solar Keymark is mandatory.

Finally, the need for better coordination between the Governmental bodies and strategic steering of the sustainable energy sector was underscored by many stakeholders. In many cases the Ministries have been observed to act in an isolated manner rather than trying to identify synergies and cooperate. Also, the importance of a better structured dialogue between the Government and the private sector in the sustainable energy business was emphasized. There is also a need to bridge the communication gap between the public and private sector.

(2) Missing link between energy entrepreneurship, innovation and applied research

Innovation and entrepreneurship are grounded in the application of scientific research. Science and technology are a major catalyst for the creation of innovative products and services. In 2015, Barbados ranked 37 out of 141 countries in the Global Innovation Index. The Technology Readiness Index compiled by the World Economic Forum (WEF) is based on indicators of the availability of the latest technologies, firm-level technology absorption, foreign direct investment and technology transfer, internet use, broadband internet subscriptions and internet bandwidth. Barbados was ranked second in terms of technological readiness within the benchmark group of countries in 2013-14, largely owing to high internet penetration rates and availability of technologies.

However, as revealed by several assessments, Barbados needs to put more emphasis on the nexus of innovation and entrepreneurship. The 2013 Private Sector Assessment Report concludes with the following SWOT Analysis and identified the following three main issues as significant hurdles to private-sector development:

1. Public sector productivity
2. R&D activity by the private sector and
3. Finance for start-ups

Figure 7: SWOT Analysis of Private Sector Development in Barbados

	Helpful	Harmful
Internal Origin	<p>strengths: Historically low rate of inflation High level of female participation in the labor force Good institutions Effective leadership Institutions supporting private sector Technological penetration</p>	<p>weaknesses: Slow pace of economic recovery Rigidities in the labor market Long lags for licenses and permits Low R&D expenditure Export ubiquity</p>
External origin	<p>opportunities: Low rates of corporate tax Good infrastructure Low levels of crime and corruption Financing mechanisms supporting small businesses Availability of technology</p>	<p>threats: Stressed natural resources Rising level of national debt Large current account deficit Lack of awareness of financing opportunities</p>

The Sustainable Energy Industry Market Assessment (SEIMA) undertaken in the PPG phase identified R&D as a key requirement for successful sustainable energy businesses and solutions. Generally, there is an unharnessed market for energy (and wider climate and environmental) technologies and solutions adapted to the Caribbean and SIDS needs. However, currently R&D is more happening ad-hoc rather than in a planned way in Barbados. There is no clear strategy to promote private and public R&D in priority technology areas with high GHG emission reduction and local value creation potential. An undertaken survey during the PPG phase revealed that existing energy businesses only spend small amounts for R&D, often less than USD 30,000 annually. In the solar-thermal sector, over the last years only incremental improvements have been made on the frame design or material thickness of absorber plates, but no research – neither on market intelligence nor on product development – has been undertaken nor have any innovative products or market approaches been tried. The adoption of new solar-thermal solutions (e.g. large-scale water heating, process heat, or cooling) requires partnerships with international R&E programs and partners (e.g. IEA, AEE-Intec).

Barbados' involvement in PV and small-scale wind turbine research and development can be traced back to the 1980s. However, such attempts remained more the initiatives of individuals. R&D would be required for the optimum design, selection of components and equipment for e.g. more complex AC systems (as for office buildings and hotels) and cooling/chilling equipment as for food and beverage processing. Basically, all areas, from finding the proper agricultural techniques to growing bio-energy crops, through establishment of continuous supply chains, to the proper design and operation of bio-energy plants at different scales, would need local R&D. Testing of batteries against energy performance and safety- and grid-stability requirements would be needed to further expand the use of electric vehicles.

There is need for a stronger cooperation between applied science institutions and the private sector to work on innovative energy technology solutions with high GHG emission reduction and value creation potential. Some funding programs to support the linkage between R&D and technology innovation are in place (e.g. innovation fund) but have a limited focus on sustainable energies. In parallel, there is the need to strengthen protection of intellectual property and patents to build trust and increase the confidence for technology businesses. The current weak regulations were mentioned as a concern by the private sector.

(3) Lack of human capacities, quality and certification standards

Innovation and entrepreneurial activities need the right mix of: education and training, research and development, applied science and technology, as well as financing. The promotion of sustainable energy markets requires training of many different stakeholders in different sectors on a variety of skills (e.g. plumbers, architects, engineers, financiers, policy makers, farmers, consultants). The employment analysis of the SEIMA states that throughout the next five years 700 people would need special training (short or long term) so as to be prepared for the transition to a sustainable energy industry and its related services.

However, it is commonly agreed that the level of expertise emerging is not enough to reach the scale of technological innovation that the private sector expects and needs. Greater investment in the sustainable energy area will be required in the coming decades so as to ensure an increase in the number of people trained that can effectively engage in the private sector and the Government. During the PPG consultations, the lack of local capacity has been repeatedly reported as the major bottleneck for the implementation of RE and EE promotion programs in Barbados (e.g. by IADB).

The current capacity building efforts are more happening ad-hoc rather in a planned way in Barbados. Up to now there are also no certification standards for professionals in the sustainable energy field in Barbados. This makes it difficult to guarantee standards in the industry. For example, in the solar thermal sector, the training of installers and workers for manufacturing happens on the job, as there is no specific training offered otherwise. There is no installer certification scheme in place. Companies such as Williams Ind., BL&P, MEGAPOWER and Caribbean LED Lighting have offered training opportunities for students. A number of businesses are attempting to improve

the situation by providing internships, particularly for students of the Samuel Jackman Prescod Institute of Technology (SJPI). There have also been partnerships involving capacity building at the Barbados Community College (BCC) and University of West Indies (UWI) and there have been useful inputs into courses offered by TVET institutes.

There is the need for a sound certification, qualification and accreditation framework for sustainable energy services and personal. The country is well known for its technical, vocational and academic institutions such as the University of the West Indies (UWI), Samuel Jackman Prescod Institute of Technology (SJPI) and the Barbados Community College (BCC), and it is clear that there is a vision within these institutions to create and strengthen the workforce in this field. In the past, academic institutions have had a reputation of being somewhat „disconnected from businesses”. The MSc in Renewable Energy Management previously offered by the Department of Pure and Applied Sciences at UWI, included modules dedicated to the development of wind energy technology and some students have undertaken projects specifically in this area.

(4) Lack of cooperation and knowledge sharing

Lack of cooperation between businesses and other essential stakeholders of the innovation process is a major bottleneck in Barbados. Innovation occurs largely in the private sector industry and technology start-ups. The sustainable energy industry in Barbados has recently started to organize itself through the Barbados Renewable Energy Association (BREA), but in general the degree of cooperation and collaboration of the stakeholders still remains limited.

Collaboration and knowledge transfer between these entities in Barbados is rare due to the different nature of the actors. This was identified as a key barrier during discussions in the first PPG workshop and a number of the bilateral meetings, and often also called a „cultural relic”. Members, especially in industries where there is intense competition, felt uncomfortable about coming together to share information and ideas and potentially reveal important 'trade secrets'.

During the PPG phase, private sector experts framed the term “co-opetition” in recognition of the fact that there would need to be co-operation developed within the framework of a competitive market. For this to be achieved there would be need for a greater level of trust. Protection of intellectual property and patents play an important role in developing this trust. The solid foundation for co-opetition needs to be a formal network (platform) between SMEs, industrial clusters, national government ministries, academia, industrial associations (e.g. Barbados Investment Development Corporation, Barbados Chamber of Commerce and Industry, Barbados Manufacturers Association, Barbados Renewable Energy Association, Barbados Association of Energy Professionals), financing institutions, foundations, the diaspora and venture capitals within Barbados and overseas. In this context, the applicability of a technology cluster concept was studied during the PPG phase of the GEF project.

(5) Lack of tailored finance for technology innovation and industrial development

Businesses in Barbados - and particularly small businesses, which lack the access to international credit markets that some larger firms enjoy - find it difficult to access credit, despite the availability of funds in the financial system. Existing financing mechanisms of the Government to promote SMEs do not include sustainable energy as a priority or are only focused on funding traditional sustainable energy investments (project finance) rather than start-ups or the commercialisation of innovative business ideas, products and services. The Private Sector Assessment Report 2013 identified lack of finance as major bottleneck for start-ups.

The PPG consultations confirmed that the perception among interviewees that traditional financial institutions do not provide financing for start-ups or R&D investments unless collateral is made available in the form of assets such as land, houses or patents. The reality is that the banking sector in Barbados is largely a “retail banking”

sector with a focus on shorter term returns rather than long-term investments; there are no “development banking” structures in a real sense. This gap stymies the scale, depth and speed at which energy innovation and experimentation in Barbados can take place. A strong need for a dedicated financial support window which provides a grants and/or concessional loans for sustainable energy start-ups and innovations was expressed.

Many of the current sustainable energy initiatives are developed without or very little support. Such grass-root developments include exploring new markets (e.g. PV on fisher boats), local manufacturing (e.g. micro-wind-turbines) and combining different technologies for new market segments (e.g. fully air-conditioned green houses to grow high value crops, powered by green tech).

(6) Barriers for regional and international market access and strategic investments

Since Barbados has the intention to become a hub for sustainable energy, climate and environmental technology solutions, there is need for a well-coordinated strategy to promote the development of competitive sustainable energy quality products and services which are able to compete in the Caribbean and international context. Barbadian companies need a clear comparative advantage and/or serve as a hub for international companies. Despite the existence of a number exporting sustainable energy businesses, Barbados is promoting the area currently not strategically and under a common branding. The example of the Barbadian solar thermal sector has demonstrated that it is possible, under specific circumstances, and a certain maturity of local productive capacities. Since 2011 the company Caribbean LED Lighting Inc.¹¹ (CLL) has been successful in assembling LED lights, fixtures and lamps (incl. street lights) and in the distribution of these and other products. The areas of RE can be also an interesting marketing tool for the tourism sector and high-value agro-products.

¹¹ <http://caribbeanledlighting.com/>

Baseline projects

The GEF project will base its activities on the efforts of the Government to reduce the barriers for the uptake of sustainable energy markets and industries.

→ Government

The Sustainable Energy Investment Program or Smart Energy Fund is a partnership of the *Government of Barbados and the Inter-American Development Bank*. Operational since 2012, the 10 million USD program comprises a low interest financing and grant program for promoting the use of sustainable energy solutions in the private sector. Aiming to ‘jump start’ the RE and EE market in Barbados, the Fund targets industries, SMEs, as well as the residential sector. SMEs benefit from a grace period and an interest rate of 1% and consumers benefit from facilities that enable innovative finance mechanisms and access to products free of charge e.g. the compact fluorescent lamps available to some consumers via vouchers. Amendments to the Barbados Income Tax Act in 2013, 37J (1) and (2), allow for a claim for tax deduction of 150% of the interest on a loan for a number of purposes relevant to RE/EE. The fund is implemented in partnership with the Enterprise Growth Fund Limited. The first phase of the fund ended in 2017 and currently a 2nd phase is designed. Under the umbrella of the GEF project there are discussions with MIICs and DoET to establish a tailored financing facility which provides grants and concessional loans to sustainable energy start-ups and businesses in parallel to the demand-stimulating activities of the fund.

The Public Sector Smart Energy Program is a collaboration between the *EU and the Government of Barbados*, the Division of Energy and Telecommunications (DoET). The first phase of the program has a total budget of USD 24 million, with 17 million USD from the IDB and 7 million USD from the EU as grant funding. It focuses on street light replacement, RE and EE, ocean energy, electric vehicles and capacity building. The program engaged stakeholders from government, NGOs, the private sector and education/training. It aimed to replace up to 30,000 street lights and save up to 3 million USD annually in electricity savings and retrofit at least 12 government buildings¹². The project was initially to go from 2013 to 2016. However, due to local capacity constraints of the private sector it had to be extended. Currently, a second phase for the program is designed. Under the umbrella of the GEF project there are discussions with MIICs and DoET on a special funding window to promote sustainable energy start-ups and businesses in parallel to the demand-stimulating activities of the program.

The GEF project will link-up to various Governmental financing instruments promoting SMEs in economic key sectors. Most of these programs do not have particular focus on RE and EE solutions. Some of these instruments are the Enterprise Growth Fund, the Agricultural Development Fund, the Export Promotion and Marketing Fund, the Innovation Fund, the Industrial Investment and Employment Fund, the Small Hotel Fund, the Tourism Loan Fund and the Special Technical Assistance Programme.

The Sustainable Energy and Climate Technology Cluster promoted under this GEF project will create strong synergies to the initiative of the Ministry of Education, Science, Technology and Innovation to establish a FAB LAB (fabrication laboratory) as a supporting mechanism for inventors and innovators. A FAB LAB is generally equipped with an array of flexible computer-controlled tools that cover several different length scales and various materials, with the aim to make a wide range of “items/devices”. Facilitating prototyping, the lab will provide an opportunity for entrepreneurs to have a space to experiment and explore at low-cost. Working through a committee comprised of the University of the West Indies, the Technical & Vocational Education and Training Council, the Barbados Community College (BCC) and the Samuel Jackman Prescod Institute of Technology (SJPI), the FAB LAB is expected to play a critical role in meeting the policy objective of expanding the role of small and medium-sized businesses in the economy.

¹² <http://www.energy.gov.bb/web/component/content/article/75-partnerprojects/264-public-sector-smart-energy-program>

The GEF project will closely work with the Barbados Investment and Development Corporation (BIDC) on the establishment and operation of the technology cluster. BIDC is the main governmental agency to promote the development of bold, innovative, dynamic and creative enterprises. BIDC's vision is to be the catalyst for developing innovative, productive and internationally competitive businesses. BIDC's core services include a.) entrepreneurial development, b.) export development and promotion, c.) research and information services, d.) property development and leasing. BIDC tries to support the local industry by bringing groups together in clusters where they are better able to produce for the international markets, in shared facilities that offer modern production processes and better structured factories. Over the last few years BIDC had cluster building activities for furniture manufacture, condiments (pepper sauce, seasoning) and apparel.

→ International and sub-regional

The Programmatic Energy Policy-Based Loan (PBL) from the Inter-American Development Bank (IDB) has served as one of the primary instruments to create the impetus for regulatory, policy, and legislative reforms necessary for the promotion of sustainable energy. Around USD 115 million of loans were signed with the Government for the implementation of the Sustainable Energy Framework for Barbados (SEFB I&II). Synergies exist also to the IADB supported BRIDGE program which is focused on developing human capital to meet the expected future demand for technicians, professionals and entrepreneurs in the sustainable energy and information and communication technology sectors.

The Caribbean Development Bank (CDB) is currently undertaking a market assessment as part of the preparation of a project looking at the EE potential of the residential sector in Barbados (Canadian funded). Simultaneously, the CDB also has the SEED Programme for EE in public sector buildings (EU Grant); as well as the regional wide GEO Smart Programme which promotes the geothermal energy development in the eastern Caribbean (together with the IDB and the GCF).

UNDP and the EU have recently launched programs for the promotion of solar photovoltaic systems for public buildings and schools (through GEF-5 and the EU National Indicative Programme 2014 to 2020). The IADB is currently preparing a USD 24 million loan program for the deployment of cleaner fuels (focus on Liquefied Natural Gas (LNG) to replace HFO for power generation).

Barbados is also benefiting from a number of regional initiatives such as the Caribbean Hotel Energy Efficiency Action Programme, the Eastern Caribbean Energy Labelling Project (ECEL) or the GIZ-REEETA Programme. In addition to its national activities, the EU will support the Caribbean region with a EUR 54 million support program from the 11th EDF. This will include support through the EU Electrification Financing Initiative ElectriFI, the Caribbean Investment Facility, as well as the Technical Assistance Program for Sustainable Energy in the Caribbean (TAPSEC) to support the C-SERMS implementation process and CCREEE.

Links to the Partnership for Action on Green Economy (PAGE) will be created. PAGE represents a mechanism to coordinate UN action on green economy. Bringing together the expertise of five UN agencies - UNEP, ILO, UNDP, UNIDO and UNITAR - and working closely with national governments, PAGE offers a comprehensive and coordinated package of technical assistance and capacity building services. Barbados will join the partnership in the course of 2017. First financial resources are available and a focal point was appointed in the Ministry of Environment and Drainage.

The GEF project will closely coordinate with the CARICOM Energy Unit and the C-SERMS process. The Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE), which was established with technical support of UNIDO and financial assistance of the Austrian Development Agency (ADA) and the Government of Spain. Around USD 2,5 million are available for the first operational phase of the center (2015 to 2019). The center is part of a partnership with SIDS DOCK, which aims at the creation of a network of regional sustainable

energy centres for SIDS in Africa, Pacific, Caribbean and Indian Ocean.¹³ ECREEE, based in Cape Verde, is already operating in West Africa and the Pacific Centre for Renewable Energy and Energy Efficiency (PCREEE) is currently establishing its offices in Tonga. CCREEE is also part of the Global Network of Regional Sustainable Energy Centres.¹⁴

The GEF project and the cluster will create links to the Climate Innovation Centre Caribbean (CIC-C), based in Jamaica. With a regional portfolio, the CIC-C aims to be the main enabler for Green Tech Entrepreneurs' entry into global markets while creating a cleaner and safer environment through innovation in the Caribbean. Focusing on the area of technology commercialization, market development, mentoring and training, and incubation, the CIC-C focuses largely on climate-related issues. Its overall mission is to “develop a vibrant cleantech ecosystem in the Caribbean and to provide access to space, resources, and funding to empower start-ups and businesses to expand while developing innovative solutions to climate change” this approach is aligned to the ecosystem approach also being proposed in the SEC cluster concept for Barbados. Launched in 2013 as a Consortium jointly managed by two leading scientific institutions in the Caribbean, the Scientific Research Council (SRC) based in Kingston, Jamaica and the Caribbean Industrial Research Institute (CARIRI) located in Trinidad and Tobago, is part of infoDev's Climate Technology Program (CTP). Supported by the Government of Canada, the World Bank and other institutions, it also has a strong network including other CICs Centres world-wide. So far, it has more than 700 clients, has created more than 32 new jobs, and trained more than 300 entrepreneurs¹⁵.

→ Private sector and civil society

The Barbados Renewable Energy Association (BREA) is a NGO focused on renewable energy and energy efficiency at the residential, commercial, industrial and national levels. It will be an important partner regarding the work of the GEF project on capacity building and certification, as well as policy dialogue. The Association's Vision Statement is “To create a business environment in RE conservation and EE initiatives in Barbados conducive to ensuring a sustainable present and future.”, and the mission is “To facilitate the growth and development of RE and promote the adoption and implementation of RE, energy conservation and EE initiatives in Barbados.” BREA has a board, secretariat and about 20 key members. BREA currently has a focus on public awareness on RE&EE and political lobbying for PV. *The Barbados Renewable Energy Association and GIZ* (Deutsche Gesellschaft für Internationale Zusammenarbeit) which provides services in the field of international development cooperation are partnering on the Integrated Climate Risk Management (ICRM) to the Barbados Renewable Energy Sector project. The project focuses on residual risk, risk transfer and sharing mechanisms such as insurance.

The existing technical, vocational and academic institutions such as the University of the West Indies (UWI), Samuel Jackman Prescod Institute of Technology (SJPI) and the Barbados Community College (BCC) are important partners for the GEF component on capacity building. The MSc in Renewable Energy Management previously offered by the Department of Pure and Applied Sciences at UWI, included modules dedicated to the development of wind energy technology. This MSc has now been suspended but is expected to be restarted as a MSc in the CERMES Department at UWI Cave Hill.

¹³ <https://sustainabledevelopment.un.org/partnership/?p=7639>

¹⁴ www.se4allnetwork.org

¹⁵ <http://www.caribbeancic.org/impact>

A.1.3 Proposed alternative scenario

→ Alternative scenario

In the business as usual (BAU) scenario the uptake of RE and EE investments in Barbados will continue to be hindered by the weak innovation and productive capacities of the domestic sustainable energy industry. In this scenario, the attainment of the ambitious sustainable energy, climate mitigation and green economy objectives of the Government remains uncertain. The SEIMA, undertaken during the PPG phase, developed an alternative scenario which builds on a significant strengthening of the private sector capacities in technology areas with high GHG emission, market and value creation potential. Through the mitigation of existing barriers for the private sector, the GEF project will contribute to the attainment of this alternative scenario.

On the demand side, the assessment identified priority sustainable energy products and services with high GHG emission reduction, market growth and value creation potential in Barbados and the wider Caribbean. Particularly, but not exclusively, emphasis was given to market opportunities in the following economic sectors: generation and distribution of power and energy services, construction, fisheries and agro-processing, tourism, transport, waste management, as well as water/desalination. On supply(ier) side, based on a SWOT analysis, the existing (sustainable energy) industry was analyzed with regard to its ability to provide competitive energy products and services in the identified growth areas. The assessment identified the following priority areas with high GHG emission reduction and local value creation potential:

- PV
- small scale wind
- electric storage
- electric vehicles / charging infrastructure
- solar thermal heating & cooling
- energy efficiency in buildings, lighting and appliances

Each of the technologies were assessed according to a set of criteria (e.g. growth potential, emission reduction potential, domestic value and job creation potential, potential for the Barbadian industry to provide competitive products and services). The following table summarizes the main findings of the SWOT analysis for these technologies. Further details can be found in the pre-feasibility study.

Figure 8: Summary of the SWOT analysis on priority SE technologies

	Helpful	Harmful
Internal Origin	strengths: Huge GHG emission reduction potential Established market with experienced players to mainstream technologies Experience in assembly or fitting of components Generally good image of SET in the public Economic viability is acceptable for early adopters	weaknesses: Lack of local experience and design/engineering capacity for large scale systems or not so common but otherwise well-developed technologies Key parts/components are imported Economic viability is not acceptable for mass market
External origin	opportunities: Geography (island/distances, sun, wind) offers favorable conditions Role model for many others in the region Strong market potential in hotels Strong growing market nationally and in the region	threats: Geography (land scarcity, salt spray, hurricanes) provides higher risks Low incentives / tax system not in support of activating the low-income household or hotel & tourism industry Land issues for large scale installations

Perspectives for job growth Some market potentials in specific niche markets (not identified potentials still available) Low competition from external suppliers	Market regulations to weak (regulations not certain enough to reduce risks for investors, regulations not strong enough to impose a demand) Changes in fiscal and financial regulations can bring market easily to a stand still
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The alternative scenario projection shows that PV and electric vehicles would have the highest GHG emission reduction potential if they are combined with smart storage solutions. Wind power is theoretically very competitive but due to the limited sites and resistance it remains a theoretical scenario. Energy efficiency, in general, offers huge GHG emission reduction potential as well. The potential of solar thermal is by factor of 10 lower, and the potential of energy management by a factor of 100. The table below summarizes top-down potentials based on the current grid emission factor in Barbados.

Figure 9: GHG emission reduction potential of different RE and EE scenarios

Technology	Electricity	Gas	conv. factor	GHG emission reduction
	kWh/a	kWh/a	kg/kWh	t CO ₂ /a
Solar-thermal domestic	40,000,000		0.7906	31,624
Solar-thermal hotels		2,250,000	0.2975	669
Solar-thermal industry		1,250,000	0.2975	372
PV 300 MW top down for 100/100	647,500,000		0.7906	511,914
PV 197 MW top down for 100 % RE	344,750,000		0.7906	272,559
Wind, 200 MW to down for 100 % RE	972,800,000		0.7906	769,073
Biomass	25,000,000		0.7906	19,765
EE cooling	200,000,000		0.7906	158,120
EE appliances	200,000,000		0.7906	158,120
EE buildings	200,000,000		0.7906	158,120
EV - 90 % of current emissions from transport				400,000
Energy management in SMEs and industrial processes	10,000,000		0.7906	7,906

The assessment also estimates the potential positive job effects of the alternative scenario. The current employment rate of 200 full time equivalents (FTE) in the sustainable energy sector would double in 5 years to about 400 full time equivalents (FTE) in total. The biggest share would have the RE sector, and here it is mainly the existing solar-thermal manufacturing and installation, and the PV installation and potentially a PV assembly or special production. Wind power and other alternative energy projects could employ about 25 FTE in 5 years, mainly in project development, sales and maintenance functions.

Electric vehicles could grow from 5 to about 25 staff in 5 years, mainly in the areas of special sales and maintenance services, yet if these jobs will really be new ones or just improved ones from conventional car services can be discussed. Energy efficiency technologies and services could employ 75 FTE in 5 years but with already a strong base of 50 due to manufacturing and sales activities on LED lights. Electric storage and other innovative energy services (Energy 2.0) could grow from currently 8 to about 30 FTE. Although the building and construction sector is a large employer, the effects on jobs (+7) as a result of improved energy or resiliency performance is not significant. Energy services such as auditing, management systems and ESCOs will not have a strong effect on FTEs.

→ Project approach

In line with the proposed alternative scenario, the GEF project focuses on the mitigation of the barriers for the sustainable energy manufacturing and servicing industry in areas with high GHG emission and value creation potential in Barbados and the wider Caribbean. Particularly, the project will:

- a. establish a public-private platform for regular policy dialogue to promote coherent demand and supplier-oriented cross-sectoral policies, regulations and incentives;
- b. establish a physical sustainable energy and climate cluster hub which provides businesses with communication and networking space, start-up support (e.g. co-working and maker space, incubation services, common marketing/branding), as well as capacity building;
- c. strengthen the cluster members by establishing a funding window which provides grants and concessional loans for the commercialisation innovative business ideas and industrial up-grading;
- d. promote networking and joint ventures between the cluster members and entrepreneurs, investors, venture capitalists, financiers in the Caribbean, other SIDS, internationally (incl. the diaspora);
- e. contribute to the creation of qualification and certification frameworks for personal, equipment and services and provide targeted training to current and future members of the cluster;

With this approach, the project will, with a relatively small GEF grant, have significant impact and leverage co-financing from the public and private sector. The project will draw lessons learned from the GEF UNIDO Cleantech Programme for SMEs when it comes to the promotion of innovative clean tech start-ups and business ideas. However, the project will go beyond the promotion of start-ups and will focus on the classic elements of industrial development (e.g. cluster-building). The project will adopt an inter-disciplinary approach involving national Ministries and institutions, academia and research centres, industrial associations, financing institutions, foundations, venture capitalists and utilities.

The proposed approach is fully in line with Objective 1 of the GEF-6 Climate Change Mitigation Strategy, which aims to promote innovation, technology transfer, and supportive policies and strategies, with Program 1 focusing specifically on the promotion of the timely development, demonstration, and financing of low-carbon technologies and mitigation options. It responds also to the GEF Private Sector Strategy. The GEF-6 private sector engagement approach supports private or public energy service companies and SMEs to promote RE and EE.

First positive results of the GEF project could already be demonstrated during the PPG phase. Based on the undertaken market assessment and pre-feasibility study, the Government has already decided to support the creation of a sustainable energy and climate cluster and earmarked considerable co-financing for the project. Moreover, already a number of companies and start-ups have decided to form various working groups in the cluster and started to think on potential innovations particularly in the areas of power storage, electric vehicles and efficient and hurricane resilient roofs. The private sector has already earmarked considerable co-funding.

The GEF project is being developed under the umbrella of a joint declaration, which was signed by the GoB and UNIDO at the margins of the Third International Conference on Small Island Developing States, held from 1 to 4 September 2014 in Apia, Samoa. The declaration agreed on UNIDO technical assistance for the operationalization of the Barbadian vision to become a green circular economy. The joint declaration is explicitly mentioned in the NDC of Barbados as an important instrument of implementation. The GEF project is also part of a strategic partnership with the Government on the Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE) in Bridgetown, Barbados.¹⁶ The cluster to be established under the GEF project will take advantage of the sub-regional knowledge management, capacity building and business promotion activities of the centre.

¹⁶ CCREEE website: www.ccreee.org

→ Component 1: Policy and Regulatory Framework

The main objective of this component is to contribute to the development and implementation of a common long-term vision for the sustainable energy and climate industry hub Barbados. A vision statement for the promotion of Barbados as a hub for sustainable energy and climate technologies and services will be developed in line with the objectives in the National Strategic Plan (output 1.1.2). This requires regular dialogue between governmental bodies, as well as the public and private sector. The joint vision will be published and used as a marketing tool. To formalise this dialogue, MIICS, in close coordination with DoET and the Ministry of Environment and Drainage, will establish a strategic dialogue platform which will bring together high-level representatives and senior experts from public institutions and energy companies (e.g. CEOs) on a regular basis in various constellations (output 1.1.1). BREa in representation of the private sector will channel and provide their inputs and needs to policy makers. In the meetings, the stakeholders will discuss strategic issues, identify common interests and address weaknesses. Upon request, UNIDO will act as a neutral facilitator for such dialogues.

The policy component responds directly to the identified needs for improved policy coherence, strategic steering, institutional coordination, as well as public-private dialogue. The activities under this component should lead to a better consideration of private sector interests in the existing policy and incentive framework. At least once a year, the platform will organize a high-level policy forum on sustainable energy and climate technology innovation and entrepreneurship (output 1.1.3). MIICS will be supported by the technology cluster to organize the meetings. With UNIDO and CCREEE the possibilities of having sub-regional forums will be further discussed. Gradually, in partnership with the Ministry of Environment and Drainage, the dialogues will be expanded to other climate and environmental technology areas (e.g. cleaner production, coastal protection, waste management and disposal, hurricane resilience, water and sanitation).

The dialogue platform will have an important function to identify and find solutions for policy and regulatory issues which limit private sector participation (output 1.1.4). A number of such issues are further explained in the baseline section of this document. The platform will make concrete proposals how sustainable energy growth potentials in economic key sectors (generation and distribution of power and energy services, construction, fisheries and agro-processing, tourism, transport, waste management, as well as water/desalination) can be activated. Moreover, proposals for a better integration of supplier oriented elements in demand creating sustainable energy policies and programs will be made (e.g. green public procurement). Contradictions between existing policies, legislation and incentives will be addressed jointly (e.g. existing barriers for solar-thermal use in the hotel industry and low-income housing).

The platform will also propose and review relevant quality standards (e.g. EE for buildings, appliances and lighting, as well as for locally manufactured sustainable energy equipment). The platform will provide collective input to a number of upcoming policy processes, namely:

- The Implementation Plan for the Barbados National Energy Policy (particularly section on entrepreneurship)
- The National Development Plan
- The Industrial and Manufacturing Policy
- The National Quality Policy
- The Education Strategy
- The Agricultural Policy
- The Tourism Master Plan
- The Transport Plan

→ *Component 2: Investment and business promotion*

This component will establish the Barbados Sustainable Energy and Climate Technology Cluster hub („B-Greentech”) in close partnership with MIICs and BIDD (output 2.1.1). The creation of the cluster responds to the identified barriers faced by the private sector (see baseline section). The cluster will provide a formalised dialogue and cooperation framework and will build trust between the competing businesses, entrepreneurs and other participating actors (e.g. academia, financiers). It will act as a think-tank and together with BREA it will have a strong advocacy and lobbying role in public discussions and policy formulation processes. It is envisaged that the cluster will attract significant investment by the private sector in Barbados and abroad. Through its international relations and presence, it will contribute to the image of Barbados as a hub for „sustainable tourism” and the “most environmentally advanced green country in Latin America and the Caribbean”.

During the PPG phase, a pre-feasibility study on the best alternative cluster design was developed (see annex). Private and public experts were introduced to different models of horizontally and vertically integrated technology clusters on international level. The applicability of best practice examples was reviewed (e.g. CLEAN – clean-tech cluster (Denmark), GreenTechCluster (Austria), The Blaue Lagune (Blue Lagoon) technology park for pre-fabricated homes (Austria), RE Technology Park in Güssing (Austria) and the OSTIM Industrial Zone (Turkey). Since there is not much potential for industrial value chains in Barbados, a horizontal model for the cluster was recommended.

In Barbados there is no specific demand for industrial parks where vertical integration of manufacturing/production can take place. There is also not much need for new demonstration areas to showcase innovative domestic technologies. Due to the absence of major technical academic institutions and applied research institutes there is not much potential for a research park. Therefore, the pre-feasibility study recommended a cluster model with strong focus on communication and networking, sharing-arrangements, start-up support, joined marketing and branding, capacity building, as well as joint R&D on innovative prototypes and business models. The study confirmed the technical and financial feasibility of the cluster and developed a long-term sustainability scenario.

BIDD will be the main executing partner for the execution of Project Component 2. The cluster will be established and managed by BIDD in close coordination with UNIDO and the private sector actors. UNIDO will contract BIDD for the execution of this component. BIDD has agreed to provide the hub infrastructure and will also co-finance the operations of the cluster. BIDD has strong experience in cluster building. BIDD and UNIDO will jointly agree on the recruitment of the key staff for the cluster (please see details in page 33).

The cluster and BIDD as its manager will benefit from the vast experience of UNIDO in creating and strengthening industrial clusters. Over the past 20 years, UNIDO has been involved in the implementation of cluster and network development projects in 23 countries. Based on lessons learned from theory and practice, UNIDO cluster initiatives provide technical assistance designed to foster the undertaking of joint actions among firms and support institutions. The rationale behind this approach rests in the fact that joint actions allow cluster stakeholders to overcome limitations and reap opportunities that are beyond their individual reach. Supported by the Swiss Agency for Development and Cooperation (SDC), UNIDO has established an interactive platform¹⁷ to familiarize the interested reader with the main elements of the UNIDO Approach to Cluster Development that will serve as guidance. Over the last 25 years, UNIDO has established also Subcontracting and Partnership Exchanges (SPXs) with the objective of helping local enterprises to successfully meet the challenges of globalization and to take advantage of the emerging opportunities that evolve from industrial subcontracting, outsourcing and supply chain opportunities. The SPX global network development contributes to develop and improve the efficiency of the global outsourcing and supplier network through the development of SPX Centres in different countries and regions. Over the years, this technical assistance has resulted in the compilation and development of various tools and resources, comprising extensive training material, methodologies, guidelines, manuals and software.

¹⁷ <http://www.clustersfordevelopment.org/>

Clusters are a sectoral and geographical concentration of companies or individual producers that supply a similar range of goods or services and face similar threats and opportunities. Clusters are a voluntary alliance for companies focused on the promotion of exports and services of its members. By combining their knowledge, financial resources and contacts, they can improve their export potential and reduce costs and risks. Clusters may use the same suppliers of raw materials, cater to the same markets and clients, share the same territory, infrastructure and services, as well as face common challenges. Cluster building is a tool to upgrade productive capacities, increase access to international markets and generate innovation spin-offs.

A set of incentives for private sector companies to participate in the cluster will be established by the Government of Barbados and the cluster management. Before the formal launch of the cluster, the manager will develop the rules and procedures, as well as the membership requirements for various partners (e.g. businesses, academia, financiers/investors). Particularly, clarity on the ownership of patents and intellectual property rights will be an important factor that is going to be taken into account based upon UNIDO's extensive experience on cluster building. During an interim phase - until the cluster is matured – the membership will be free of charge. Gradually, the cluster might generate small reflows through member fees and small charges on the sales of prototypes which were developed with the support of the cluster. Moreover, the financing facility which will provide grants and concessional loans to start-ups and businesses is supposed to be linked to a participation in the cluster. Opportunities to promote Barbadian technology and expertise under one label will be harnessed.

Initially, the "B-Greentech" cluster will focus particularly on the following activities:

- Public award competition to identify the best name for the cluster (in partnership with schools)
- Joint cluster and product marketing and branding (e.g. website, logo)
- (Paid) guided tours to the cluster and RE&EE demonstration sites (experts, tourists)
- Support MIICS in the organization of the annual policy dialogues of the platform
- Produce a biannual Barbados Sustainable Energy and Climate Industry report
- Internal and external communication and networking
- Internal meetings and joint events and technology exhibitions
- Coaching, mentoring and team building
- Web-based knowledge system and market/business intelligence
- Award competitions for start-ups and young entrepreneurs
- Co-working space and Makers space (in cooperation with FAB LAB)
- Prototyping and commercialization of products, services and business ideas (the GEF grant will be not used to fund R&D activities)
- Joint co-operation projects and fund raising
- Use of joint legal, financial, human resources, and staff qualifications
- Capacity building in areas of joint interest (e.g. entrepreneurial skills)
- Development of standards and advocacy and inputs for enabling policies
- Match-making with clients, entrepreneurs, research institutions, financiers, investors on regional, international level, as well as the diaspora
- Biannual SEC industry report

The formation of working groups comprising various private sector companies and/or institutions (e.g. academia) will be an important element of a cluster. Working groups are formed by a smaller number of platform participants, who go into depth on a particular topic. A working group can be formed based on a request by at least 3 platform members and needs the approval of the cluster manager. First, a working group usually tries to get a common understanding of a problem/baseline through research or other assessments. Next is the development of a strategy to solve the problems/issues on resource mobilization. That could lead to additional funding (co-operation projects funded by special grant schemes, or direct funding from donors, awards), linking up with universities and strategic research partners or with other companies/sectors. The working group maintains/facilitates cooperation with regard

to know-how, research, development, funding or other activities for as long as required. The members might develop solutions or products together as a working group, yet it is also possible that product/services are the sole responsibility of the participating companies (and their intellectual property).

In line with the findings of the SEIMA, the cluster will focus on priority technologies and solutions with high GHG emission reduction and value creation potential. Right at the beginning the cluster forms the following working groups:

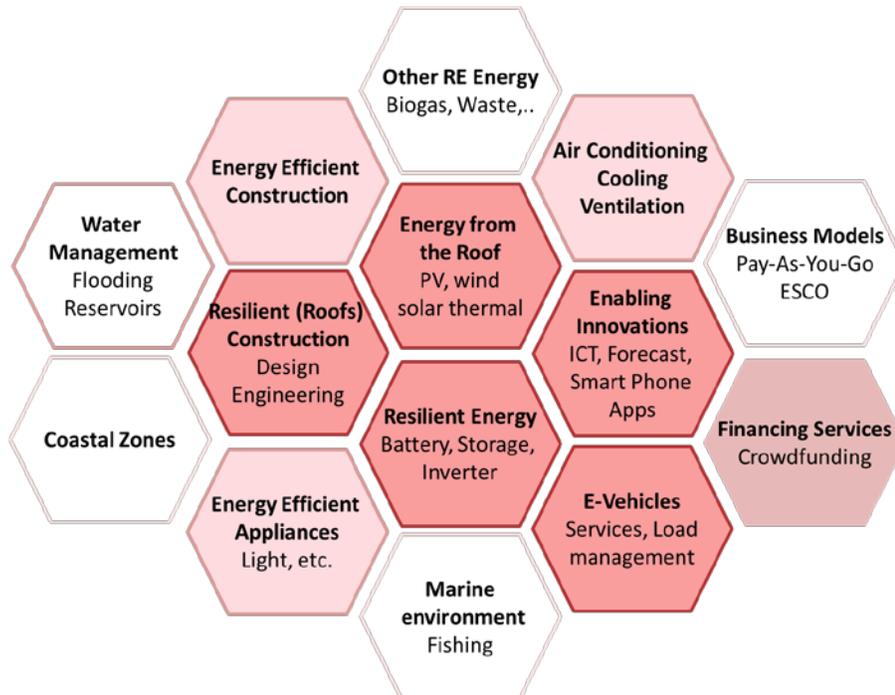
- Renewable Energy from the roof (PV, wind, solar thermal...)
- Resilient energy (battery, storage, inverters, charge controllers...)
- Resilient (roofs) constructions (design, engineering...)
- Electric vehicles (services, load management, light assembly...)
- Associated enabling innovations and financing services. (ICT, forecast, smart phone apps...)

Depending on the progress and the interest, the cluster will expand to the following areas in a second step:

- Energy efficient appliances (light, fans...)
- Energy efficient construction (shading, insulation, thermal mass...)
- Air conditioning, cooling and ventilation (solar cooling, automatization, smart controllers...)

The progress of working groups depends on the interest of the involved businesses. A potential expansion of the cluster to other climate and environmental technologies is currently under discussion between UNIDO and the Ministry of Environment and Drainage. Such an expansion scenario could be proposed for funding under GEF-7.

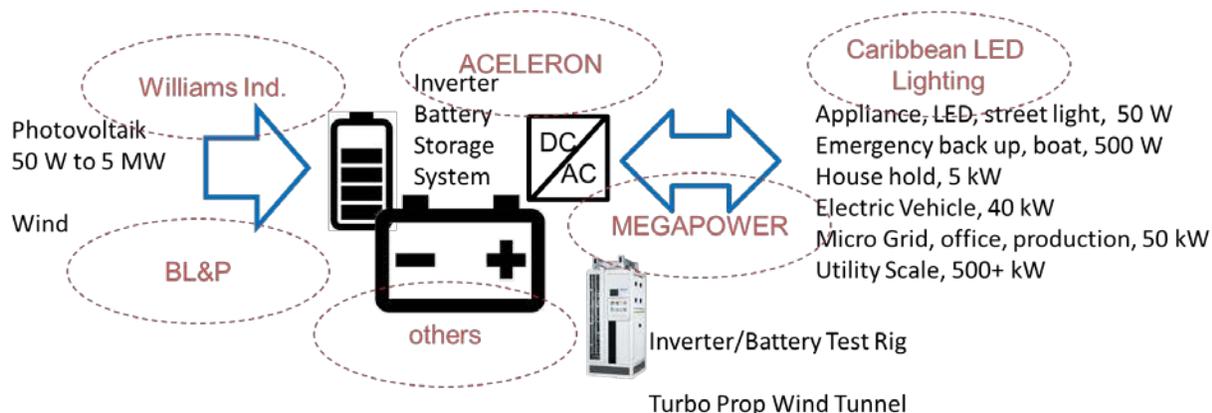
Figure 10: Priority technology areas of the SECs cluster



During the PPG phase, the working group on electric energy storage received strong interest by private sector participants. Electric energy storage is the key to modern and smart living (from watches over mobile phones to tablets and laptops and many other smart devices). Particularly in islands, storage solutions are the key enabling

technologies for the large-scale integration of RE into power generation as well as electric mobility. As the following figure shows, Barbados has companies like BL&P, MEGAPOWER, Aceleron, Caribbean LED Lighting, Williams Ind. and others, that have very specific interest in development of storage solutions and solving all associated problems and challenges. While some of them are already working together on certain aspects, there are plenty of other issues and opportunities that need to and can be solved and developed through a specific working group of the cluster.

Figure 11: Working group on electric energy island storage solutions for different purposes



Also, the area of electric vehicles (EVs) for public transport was an area of high interest. The Government is very keen on transforming the fleet of buses from diesel to EVs. The working group could work on issues such as advanced business models that are adapted to the change in the cost-structure associated with EVs, charging infrastructure, special maintenance of EVs for mass transport, or local solutions and (software) products for data loggers in vehicles that would help in tracking driving behavior and in monitoring and regulating the entire transport industry.

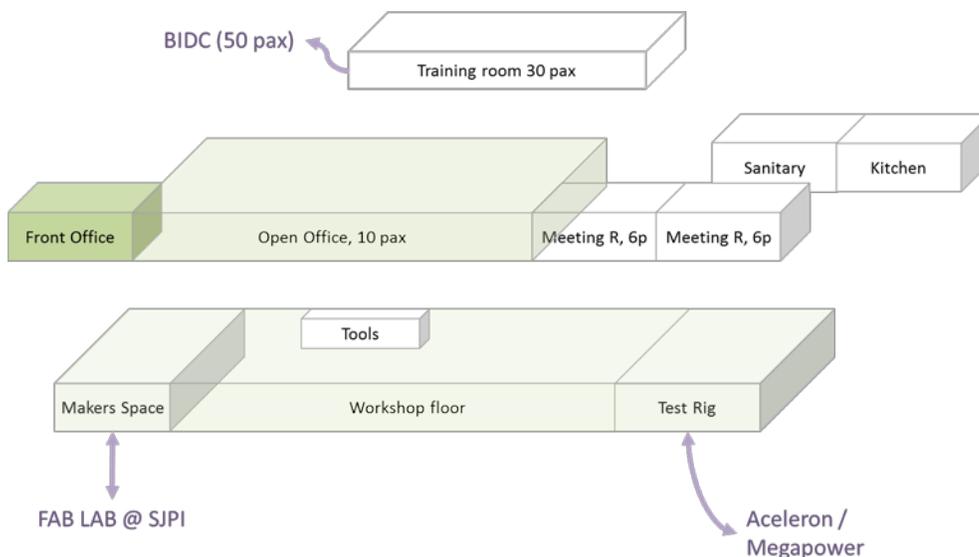
The cluster will have a physical hub to be established in partnership with B IDC. The hub links all the areas by providing a physical space for the management of the cluster, space for meetings of working groups, an open office for start-ups and a workshop floor to house the makers’-space and other facilities such as a test rig or other tools. The ideal composition for a physical infrastructure called the hub would be to provide room for the following:

- front office for 3-5 staff of the cluster/platform management
- meeting rooms (at least 2) for at least 6 people to provide a space for work groups and other business meetings
- open office room for up to 10 desks
- a large meeting room that can be used for training and other larger group meetings
- a workshop floor that can host the makers space / FAB LAB, as well as potential test rigs, and other tools and equipment
- a kitchen for preparing coffee/tea and light meals
- sanitary facilities

The workshop floor should be accessible by vehicles to test e.g. on electric vehicles. Overall the floor area should be approximately 400 m² (4000 ft²). The sketch of the hub in the figure below provides an idea of a possible arrangement and further shows current alternative options for some of the facilities. As part of their in-kind contribution (see co-funding letter), B IDC has already identified a space that will be available in a few months and would fit most of the requirements: 4,020 ft² of space located at Unit 2B, Building #7 in the Newton Business park.

This space is on the first floor of the building and has some of the areas already partitioned and thus may serve the hub’s needs.

Figure 12: The B-Greentech cluster hub



The cluster will have its own Governance structure and management team and the decision-making process will be led by BIDC with UNIDO’s inputs:

The *Cluster Board (Commission)* will be a forum of representatives of the key cluster stakeholders. Its role will be to formulate the strategic objectives for the cluster and to launch and coordinate joint activities among cluster stakeholders. The Cluster Board does not get involved with micro-management or administrative issues.

The *Cluster Steering Committee* consists of major national stakeholders that have a direct interest in the cluster development initiatives being undertaken and can provide useful inputs to them. These are expected to include the key Ministries, industrial promotion organizations, export promotion agencies, research institutes and universities and development finance institutions and banks. The Steering Committee will be responsible for promoting and launching the cluster development project, supporting the process of cluster selection and articulating development priorities. As in the case of the Cluster Commission, the Steering Committee will usually not get involved in micro-management and administrative issues.

The *Cluster Management* needs to take a strong facilitating role (leader of teams) and be strong on conflict and change management. The role of the cluster management is to build trust among the members and bring everyone together with a similar goal. For this, they have to set clear objectives and milestones and develop clear business cases. The cluster manager is the face that actively uses the channels to communicate among the members to build trust and willingness to cooperate, and reaches out to external partners. The cluster manager will be supported by an assistant manager whose role is more in creating an enabling environment for communication between the members through creation of different channels and events. The cluster management, executed by BIDC, will support the PMU in the MIICs in the execution of the day-to-day activities. The cluster management engages to:

- + External
 - o Ensure visibility - keep the issue in the forefront through public awareness and engagement/media
 - o Report on progress, outputs and impacts
 - o Support the PMU in MIICS in the execution of day-to-day activities and preparation of documents
 - o Coordinate closely with UNIDO and other partners (e.g. CCREEE, BREA)
- + Internal

- Provide social leadership
- Identify key sectors and champions
- Communicate with and among members to secure buy-in
- Make overall visions reasonable and provide clarity
- Provide clear goals and implementation plan to working groups
- Focus the working groups on results and continued workflow
- Provide a risk management framework (terms of reference, IP arrangements...)

The assistant manager works to:

- + Develop and manage communication channels (real and virtual meetings, data exchange, intranet, web communities, etc.)
- + Organize training and other capacity building activities
- + Organize outreach activities such as events, awards, campaigns, etc.
- + Identify appropriate mechanisms for funding and support
- + Promote clear principles on health, safety and environment

In practical terms the assistant manager is more ‘at his desk’ to organize things, while the cluster manager is more ‘on the road’ to meet new and existing members, solve issues among members and stakeholders, and to bring things together to develop new ideas within new working groups. All of the above might be supported by staff for administration, marketing/communication, ICT, interns and part time technical experts if funding allows.

Creation of a dedicated financing facility for promoting sustainable energy and climate technology entrepreneurship and innovation (output 2.1.2)

As a response to the mentioned financial barriers for the commercialisation of innovative technologies, business ideas and models, there is the intention to establish a dedicated financing facility to promote energy start-ups and entrepreneurship. Detailed discussion between MIICs, DoET and UNIDO are currently ongoing in the scope of the 2nd phase of the Smart Energy Fund (funded by IADB) and the Public Smart Energy Program (funded by the EU). A USD 4 million financing window is being discussed. The facility will provide grants and concessional loans (with reduced interest rates and longer payback periods) to start-up companies and existing businesses with the intention to innovate to new areas (e.g. industrial upgrading). The dedicated facility will work through call for proposals and would focus on the priority areas of the cluster. The close cooperation of the financing facility with the cluster will ensure its sustainability, and also the sustainability of funded business operations. It is the intention to execute also particular call for proposals on women energy entrepreneurship. The detailed funding policy and execution modalities will be worked out throughout the next months in close cooperation with the cluster management to be recruited. UNIDO will support the future operator of the facility through technical services. The facility will incentivise beneficiaries to become network members of the cluster. The facility will also make use of the mentoring services of the Private Financing Advisory Network (PFAN), hosted by UNIDO, wherever possible. PFAN provides finance and mentoring for the development of clean energy business plans, investment pitch, and growth strategy, significantly enhancing the possibility of financial closure.

International business/market intelligence and match-making initiative (output 2.1.3)

UNIDO, BIDC, the cluster management and CCREEE will launch a match-maker initiative which will systematically interlink Barbadian sustainable energy entrepreneurs (and other key actors of the innovation chain) with entrepreneurs, investors, venture capitalists, financiers from other islands, the international level and the diaspora. This will encourage the establishment of joint ventures, foreign investments as well as business-to-business partnerships on the identified priority technologies with high GHG and value creation potential. The initiative will also include market research and business intelligence and will provide updated information on the overseas activities of Barbadian energy businesses. BIDC will assist in attracting strategic investors for the cluster.

CCREEE will facilitate synergies to its own sub-regional entrepreneurship program and will create exchange with other SIDS through the Pacific Centre for Renewable Energy and Energy Efficiency (PCREEE) and the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE). Cluster members will get the opportunity to participate in events and training workshops of the CCREEE and CARICOM Secretariat. Start-ups will get the opportunity to showcase their prototypes in trade fairs and exhibitions. Synergies to the potential clean-tech investment forums of the Private Financing Advisory Network (PFAN) will be created.

→ Component 3: Capacity building and knowledge management

The capacity building component is fully in line with the Barbados Human Resource Development Strategy 2017-2022 and will put particular emphasis on strengthening the innovation and implementation capacities of key stakeholders regarding the identified priority technology areas in the market assessment. The approach is based on the assumption that innovation and entrepreneurial activities need a right mix of education and training, research and development, applied science and technology, as well as financing. Trainings for a broad range of stakeholders in different sectors on different skills (e.g. plumbers, architects, engineers, financiers, policy makers, farmers, consultants) are required.

The analysis of the SEIMA states that to achieve the alternative scenario, around 700 people in different sectors would need special training (short or long-term) throughout the next 5 years. However, the current capacity building efforts in the sustainable energy sector in Barbados are happening more ad-hoc rather in a planned way. In close cooperation with the key stakeholders, the GEF project will contribute to the development of a national capacity building strategy which responds to the needs of the private sector and is linked to the sustainable energy and climate vision of the Government. The objective is to facilitate trainings for at least 300 experts throughout the project duration by making use of train-the-trainer approaches and partnerships with educational institutions (output 3.1.3). To create synergies and make use of co-funding arrangements, the national activities will be coordinated with the regional capacity building activities of CCREEE.

In this context, the cluster in partnership with BREA will also generate input for the formulation of educational policies. The cluster management, in close coordination with BREA and the educational institutions, will play an important role in defining the priority areas and facilitating the execution of the short-term and long-term trainings. The trainings make efforts to increase the participation of female engineers and entrepreneurs. The capacity building efforts will be based on and embedded in the efforts of the technical, vocational and academic institutions such as the University of the West Indies (UWI), Samuel Jackman Prescod Institute of Technology (SJPI) and the Barbados Community College (BCC).

For the development of the cluster it will be vital to ensure that the latest research within the academic institutions is made available to those actively seeking to improve technologies and facilitate business activities within the cluster. To address the lack of island energy specific training resources, an online-training program on sustainable energy island solutions (output 3.1.2) will be developed by UNIDO in cooperation with the Research Centre for Energy, Environment and Technology (CIEMAT). The program will be made available to the cluster members and linked to the ongoing training programs of UWI and CCREEE.

Innovation lives from the partnership between applied research and businesses. Through the cluster, the GEF project will contribute to the development of at least two R&D partnerships between cluster members and applied research institutions in Barbados and/or abroad on priority technology issues (output 3.1.4). R&E activities will not be funded by the GEF grant. However, GEF support will be used to mobilize R&D funding from various partners for prototyping and testing. Through the maker-space the cluster will further support these activities. Synergies to the regional R&D network promotion activities of CCREEE and the University of West Indies (UWI) will be created. A potential cooperation between the Barbadian solar-thermal industry and the Solar Heating & Cooling Program of the International Energy Agency (IEA), coordinated by AEE-INTEC, will be established.

Moreover, the GEF project will contribute to the development of quality and certification standards for products, services and personal, in areas considered as high priority for the private-sector members of the cluster (output 3.1.1). This activity will be undertaken by the cluster in close partnership with BREA, the Barbados National Standard Institute (BNSI), CCREEE and the CARICOM Regional Organization for Standards and Quality (CROSQ), based in Bridgetown, Barbados. Up to now there are no certification standards for professionals in the sustainable energy field in Barbados. Qualification and certification are important pre-conditions for the functioning of sustainable energy markets. Quality issues have been significant barriers for the commercialization of sustainable energy solutions in Barbados and the Caribbean. Synergies to the BREA-GIZ partnership to develop a Disaster Resilience Qualification scheme that will certify climate resilient engineers/technicians (such a certification can reduce the insurance costs for PV installations) will be created.

Joined training and business missions for domestic entrepreneurs to other clusters and international technology hubs in the US, Europe and China will be organized in partnership with UNIDO and CCREEE. The thematic areas and participation modalities will be selected in closed cooperation with the management of the cluster. For example, a training mission for the incoming cluster management to the GreenTechCluster, the Blaue Lagune (Blue Lagoon) technology park for pre-fabricated homes and the RE technology park in Güssing is under consideration. The organisation of a “heating & cooling“ training and business missions for the domestic solar-thermal and building sector to Gleisdorf in Austria is under discussion with AEE Intec. The training mission would showcase the latest developments regarding large-scale solar thermal heating and cooling systems in various sectors (e.g. tourism, industrial process heat), as well as energy efficient designs and components in buildings. Synergies to the training missions organized by the Vienna Energy Forum will be created. A training mission to the International Solar Energy Center for Technology Promotion and Transfer (UNIDO-ISEC) in China could be envisaged.

→ Component 4: Monitoring and Evaluation

Project implementation will be monitored and evaluated on an ongoing basis for improved replication of the project activities during and after the project period. The monitoring methodology will be conducted on a periodic basis in line with the GEF, UNIDO and Government requirements. A detailed description of the activities under this component is provided in Part II, section C: Describe the Budgeted M&E Plan (output 4.1.1).

A.1.4. Incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, CBIT and co-financing;

The undertaken SEIMA (see annex) has clearly demonstrated that the country will not achieve its sustainable energy and climate changes targets if the domestic private sector is not strengthened. Due to the existing private sector barriers (see baseline section) and the mainly demand-side focused and sometimes in-coherent policy framework this will not change without the GEF intervention. Without the GEF support, the lack of domestic entrepreneurship and industrial capacity will remain a major barrier for the up-take of the sustainable energy markets and the green economy vision of Barbados. Demand-creating programs will continue to be slowed down as in the past. First positive impacts and leverage of the GEF project was already demonstrated during the PPG phase. Based on the undertaken assessments, the Government has decided to support the creation of a sustainable energy and climate cluster and earmarked considerably co-financing for the project through various sources. Moreover, already a number of companies and start-ups have decided to form various working groups in the cluster and started to think on potential innovations particularly in the areas of power storage, electric vehicles and efficient and hurricane resilient roofs.

Through its design the GEF project will secure significant co-financing resources from private sector companies participating in the expanding technology cluster. It is envisaged that at least USD 2 million will be mobilized through expanding cluster memberships during the project implementation. Already before the launch of the GEF project, a number of Barbadian businesses have committed to invest at least USD 900,000 into the cluster (see Table C and co-financing letters from Megapower, Aceleron and Williams Industries). Furthermore, BREA and

Barbados Light & Power have already confirmed their intent to invest without specifying a concrete amount. Co-financing leveraged during the implementation phase will be recorded and reported accordingly. Provided support by the financing facility to entrepreneurs and companies will be linked to a membership in the cluster. The more businesses see the added value of the cluster, the more paying memberships will be attracted. Over the life of the project by Year 2 and 3 it is expected that some of the developed product ideas would have translated into prototyping. Some of the proceeds from that, including any sales of the prototype for commercialization, would be expected to be reinvested into the cluster.

Private sector investments to be mobilized through expanding company memberships in the technology cluster	in USD
Megapower (see co-financing letter)	400,000
Aceleron (see co-financing letter)	250,000
Williams Industries (see co-financing letter)	250,000
Additional private sector investment to be mobilized during project implementation	1,100,000
Total	2,000,000

The project addresses also a gap on sub-regional level in the Caribbean Community (CARICOM). The barriers, that the private sector faces in Barbados, are even more severe in other islands. Barbados is one of the few countries which has the capacity to become a potential hub for innovative sustainable energy and climate solutions for small island developing states (SIDS). Therefore, the scaling-up of innovations and local entrepreneurial capacities in Barbados will have a wider positive climate change mitigation and adaptation impact in the wider Caribbean. There are already various Barbadian energy companies which operate branches in other islands (e.g. solar-thermal, electric vehicles, LED lighting, utility management).

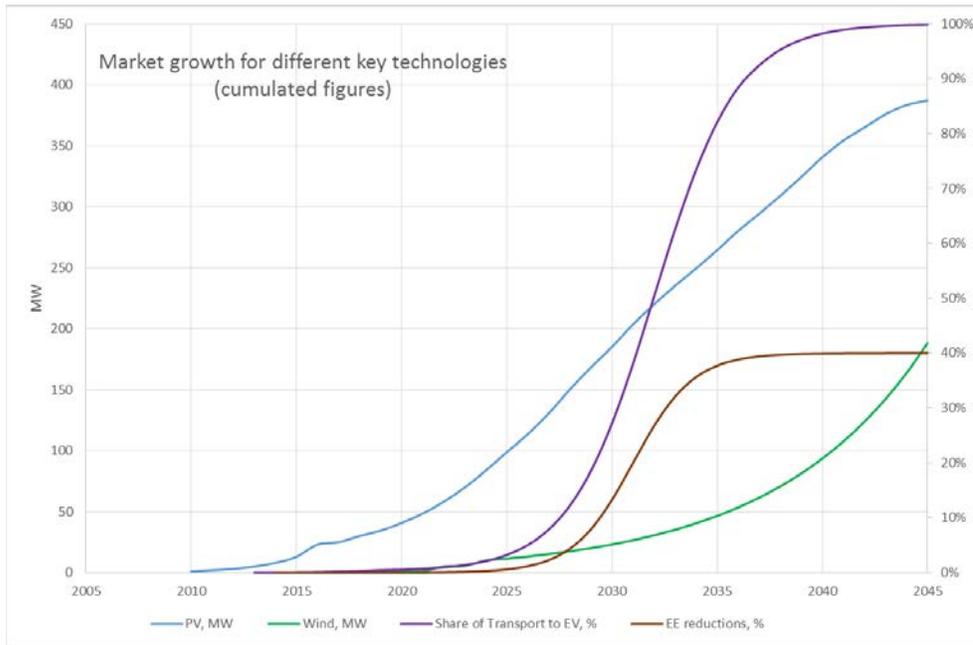
A.1.5. Global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF)

The project approach is deemed to be most cost-effective to ensure sustainable results. The combination of funding from the GEF and support from the Government and the private sector will leverage substantial investment in “green and clean” technologies not only during the project’s period of implementation but also after the completion of the project as an indirect result by having created a wider portfolio of sustainable energy products and business models. The GHG emission reduction calculation is based on the assumption that the GEF project will contribute to the achievement of the Nationally Determined Contribution (NDC) targets by mitigating the barriers for sustainable energy businesses and entrepreneurs.

In the business as usual (BAU) scenario the uptake of RE and EE investments continues to be hindered by the weak innovation and absorption capacities of the domestic sustainable energy industry. The SEIMA, undertaken during the PPG phase, developed an alternative „advanced” sustainable energy scenario which builds on a significant strengthening of the private sector capacities in technology areas with high GHG emission, market and value creation potential. The detailed GHG emission reduction calculations and assumptions are available in the annex. The developed methodology will be used in future for similar projects in other countries. Since the NDC scenario of Barbados does not include sufficient modelling data detail on how the energy related emission reductions will be achieved, the GHG emission reduction projections were based on the market assessment, the 100% study of *Hohenmeyr* and the 100/100 Vision of BL&P. The key assumptions of the BAU scenario are:

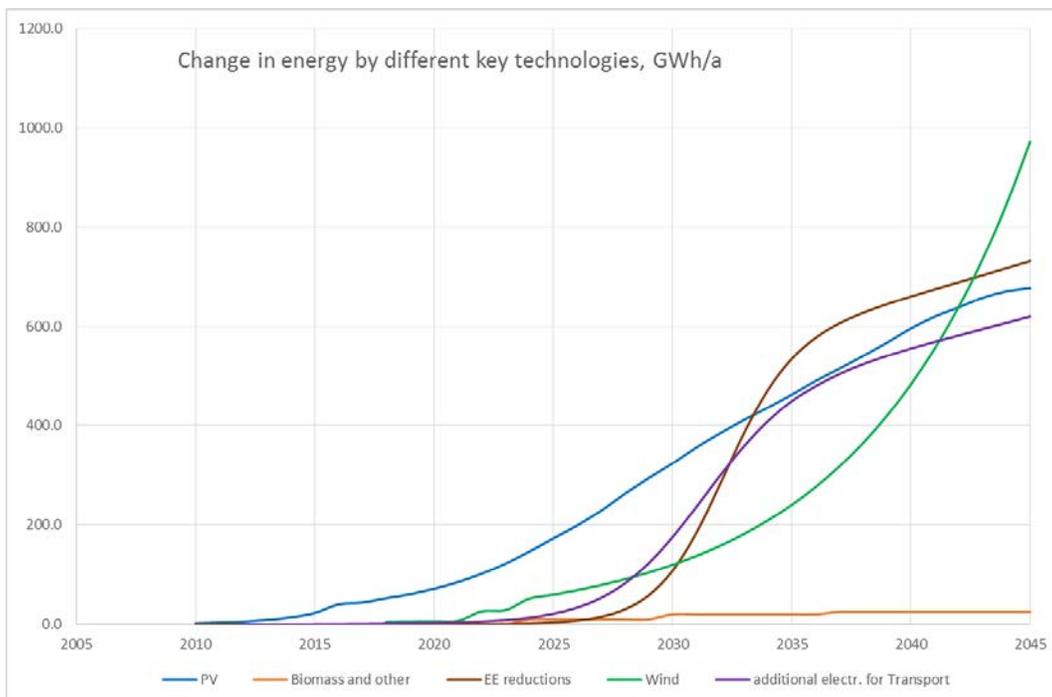
- 100% renewable electricity generation from PV, wind, biomass and other by 2045 following a moderate growth scenario of varying from 5 to 20% per year.
- 100% of transport is switched to electricity by 2045 following a typical S-curve trend.
- Energy efficiency will reduce 40% of electricity consumption and other energy uses (mainly natural gas) by 2045 following a typical S-curve trend.
- The Business-As-Usual (BAU) will have a growth of 2% per year of energy demand for transport and electricity and a stagnation for other energy uses.

Figure 13: 100% sustainable energy development scenario for Barbados by 2045



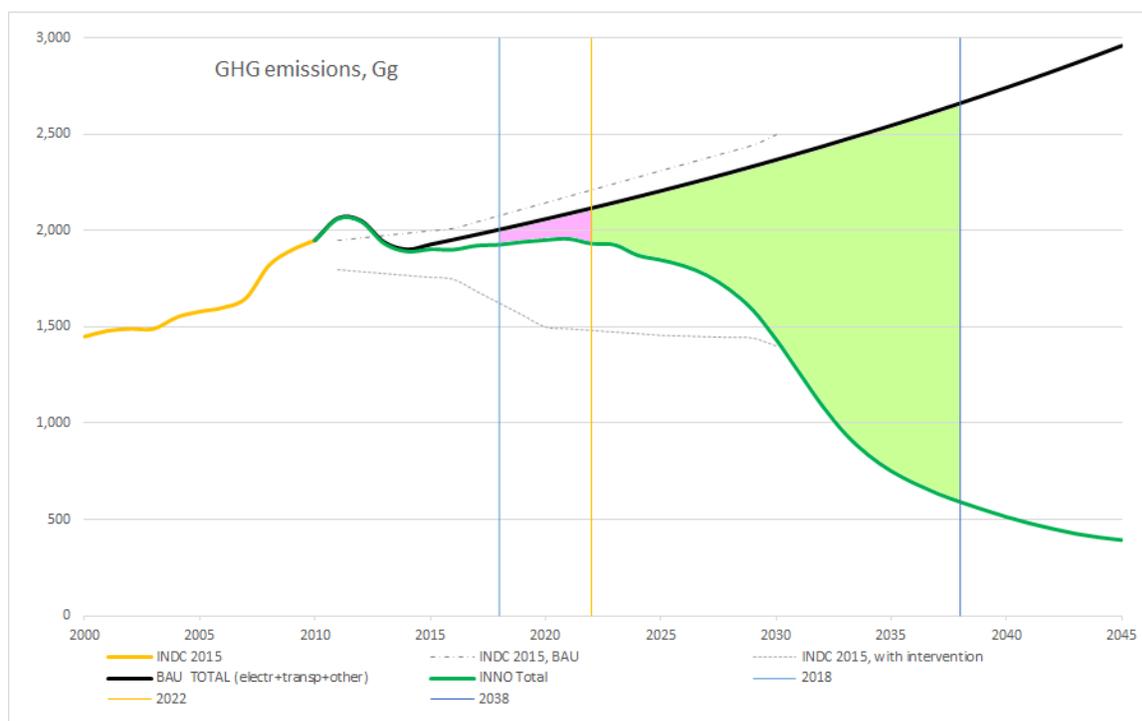
For a time window of 20 years this means that 279 MW of PV, 70 MW of wind, or 97% of electric vehicles (about 150,000 cars with a specific energy demand of 0.2 kWh/km instead of 0.6 kWh/km) have been introduced to the market. The addition of these capacities of renewables will only be possible with the integration of storage of all kinds and sizes. Hence, electric storages are the key enabling technology, although GHG emission reductions cannot be attributed directly to storage.

Figure 14: Annual energy generated or saved from key sustainable energy technologies in the 100% scenario



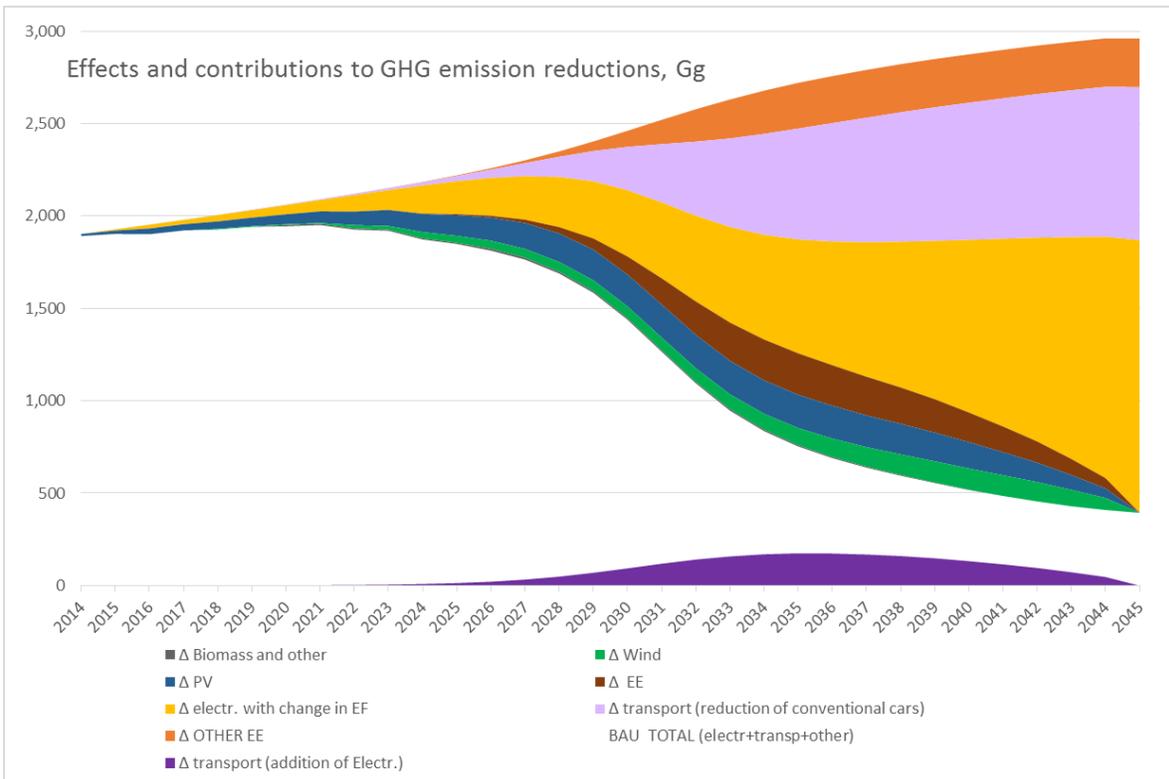
With the BAU as reference, the cumulated numbers of the GHG emission reductions over the next 4 years will be 410 Gg (lilac area in Figure 7) and 16,000 Gg over the next 20 years (lilac and green area). The indirect contribution of the GEF intervention is assumed to be 20% of the total potential GHG emission reductions, that is 3,200 Gg or 3.2 million tons of CO₂e over the next 20 years. In this scenario the direct GHG emission reduction contribution during the life-time of the GEF project of four years is estimated to be 82,000 tons of CO₂e. This translates to a unit abatement cost (UAC) of about US\$ 21.66/ton CO₂ (i.e., GEF\$ per ton CO₂). This UAC figure will be regularly re-evaluated and in coming up with the CO₂ emission reduction estimates. The assumptions are based on the fact that the technology cluster has a very high penetration rate of market players (almost 100 %) in Barbados and the intervention is for the beginning also focused on the key enabling technology – the electrical storage.

Figure 15: Cumulated direct and indirect GHG emission reductions as a result of the GEF Intervention



The figure below shows the effects and contributions of different interventions on the GHG emissions. The installation of more RE on the grid will reduce the specific grid emission factors up to zero, hence the indirect effects of RE on the grid will reduce overall grid emissions (orange). The effects of transforming the transport sector to electric cars will on the one hand reduce the number of fossil fuelled cars and their emissions (lilac), but also temporarily add GHG emissions as the grid is not fully transformed to 100 % RE (violet). EE will reduce the emissions from other than electrical uses, such as gas boilers (dark orange), and contribute to the reduction of electricity demand (brown). The direct effects of renewables like PV (blue), wind (green), bioenergy and others (dark) are only temporarily as finally at 100 % RE on the grid they reduce the overall grid emission factor to zero.

Figure 16: Contribution of RE&EE integration on GHG emission reduction by 2045 in the 100% scenario



→ Impact in the wider Caribbean region:

Since the project will have also impacts in the wider Caribbean (exports of Barbadian products and services), the regional GHG emission reductions will be also tracked. The annual electricity production in the CARICOM countries sums up to about 20,000 GWh with an annual growth rate of 3.6 % and a RE penetration of ~ 10 % (Devon Gardner, presentation at the workshop 2017-11-24, Barbados). According to C-SERMS Phase 1 Baseline Report and Assessment the projected BAU GHG emissions from the power sector in CARICOM are 17,800 Gg/a. About 50% of this can be added from the transport sector, leading to current GHG emissions of 26,700 Gg/a in the region for electricity and transport. After extrapolating the same scenarios from Barbados to the overall CARICOM situation, the potential GHG emission reductions would be around 12,000 Gg.

A.1.6. Innovation, sustainability and potential for scaling up

The GEF project is fully in line with the mandate of UNIDO to promote inclusive and sustainable industrial development and SDG-9 on industry, innovation and infrastructure. The project builds on supportive GoB's strategies to promote economy modernization, youth employment, innovation of products and services, capacity building of its work force and regional integration. The focus and design of the project is very innovative since there are currently not many GEF projects, which particularly focus on the mitigation of barriers for the sustainable energy manufacturing and servicing industry as enabler for the energy transformation.

UNIDO intends to apply the approach in the future in a broad range of countries tailored to the particular needs of medium-income countries, LDCs and SIDS. The impact of the project and cluster to stimulate the energy transformation in Barbados will be closely monitored and reused for other projects. During the PPG phase a sustainability strategy for the technology cluster was developed (see pre-feasibility study in the annex). The project is in general well embedded in the Barbadian context and the co-financing and execution modality demonstrate high levels of ownership. The execution of the cluster component by BIDC will ensure sustainability also after closure of the project. Similarly, the undertaken leadership of MIICs in coordinating the dialogue platform and policy inputs will ensure sustainability. The project will include capacity building for MIICs officials which are currently not very familiar with energy issues.

Moreover, the more businesses see the added value of the cluster and become paying members, the more the chances for continued operation after the GEF project closure are given. Over the life of the project by Year 2 and 3 it is expected that some of the developed product ideas would have translated into prototyping and incubation leading to at least two new product designs or adaptations. Some of the proceeds from that including any sales of the prototype for commercialization would be expected to be reinvested into the cluster, an initial rate of 10-20% could be a starting point. Additionally, linking the project with existing initiatives such as the Smart Hub, TAPSEC are expected to create important value-added transfers including links to potential markets. Finally, in Year 3 the project would initiate the development of concepts for additional funding including a possible Phase II cluster expansion concept.

There is also considerable room for scaling-up. The identified private-sector barriers also exist for other climate adaptation and environmental technology areas (e.g. marine and coastal protection, water and sanitation, cleaner production, waste management and disposal). Some of the barriers are even more severe due to the lower profitability of some of these solutions. There are already discussions to expand the cluster to other climate and environmental technologies relevant for SIDS under GEF-7. There are also efforts of CCREEE to establish a sub-regional programme to promote sustainable energy entrepreneurship and innovation in the Caribbean. The program could be easily linked to the GEF project and technology cluster.

A2. Child Project? If this is a child project under a program, describe how the components contribute to the overall program impact.

N/A

A3. Stakeholders. Identify key stakeholders and elaborate on how the key stakeholders engagement is incorporated in the preparation and implementation of the project. Do they include civil society organizations (yes /no)? and indigenous peoples (yes /no)?¹⁸

UNIDO is the implementing agency of the project, and is accountable for the GEF grant. The main key stakeholders of this project are as follows:

Stakeholders	Roles and Responsibilities in Project Execution
Government Partners	
Ministry of Industry, International Business, Commerce and Small Business Development (MIICS)	MIICS will host the project management unit (PMU) and will be a central executing partner for the dialogue platform and policy component of the project. It is also an important co-financer. A national project coordinator to be nominated by MIICS will be located in the PMU. MIICS will lead the coordination with all relevant public and private stakeholders. MIICS will organize the annual policy dialogues of the platform and will coordinate closely with UNIDO, the cluster management and the other relevant Ministries on the policy component of the project. The PMU and MIICS will be supported by the management of the technology cluster in the day-to-day activities and the development of documents. The cluster will be managed by BIDC, a governmental agency linked to MIICS. It is envisaged that the Ministry will take lead in sustaining and expanding the dialogue platform after the completion of the present project. MIICS and other governmental bodies will not only provide technical assistance and overall logistical support for the project management unit but also provide cash inputs for the project activities as stated in the co-financing letter.
Barbados Investment Development Corporation (BIDC)	BIDC will be the main executing partner for the execution of Project Component 2. The sustainable energy and climate technology cluster will be established and managed by BIDC in close coordination with UNIDO and the private sector actors. UNIDO will contract BIDC for the execution of this component. BIDC has agreed to provide the hub infrastructure and will also co-finance the operations of the cluster. BIDC has strong experience in cluster building. BIDC and UNIDO will jointly agree on the recruitment of the key staff for the cluster (manager, assistant) to be identified on an open recruitment process. UNIDO and BIDC will partner on a potential extension of the cluster to other environmental and climate adaptation areas in the context of GEF-7. The management of the technology cluster will support the PMU in the execution of the day-to-day activities and the development of documents.
Energy and Telecommunications Division at Office of the Prime Minister (DoET)	UNIDO, MIICS and DoET will closely coordinate on the implementation of the various activities under the three components. Significant synergies between the existing demand-side oriented support programs and the supplier side oriented GEF Project are expected to be created. DoET is also the main Barbadian partner regarding the CCREEE. The DoET is responsible for the execution of most of the donor financed RE and EE promotion programs (e.g. IADB, EU, and UNDP). There is need for close cooperation on the implementation of the goal on promoting sustainable

¹⁸ As per the GEF-6 Corporate Results Framework in the GEF Programming Directions and GEF-6 Gender Core Indicators in the Gender Equality Action Plan, provide information on these specific indicators on stakeholders (including civil society organization and indigenous peoples) and gender.

	energy entrepreneurship in the new National Energy Policy. Moreover, MIICs, UNIDO and DoET will closely cooperate on the financing SEC entrepreneurship facility to the established.
- Ministry of Environment and Drainage	The GEF Focal Point in the Ministry will chair the Project Steering Committee. The Ministry is an important partner of UNIDO when it comes to the implementation of the joint declaration “Resource Efficient Low Carbon and Circular Industrial Partnership Platform for Catalysing Eco-Innovation and Entrepreneurship in Barbados (RECIPPEE-Barbados)”, which is also part of the NDC. There might be possibilities to extend the cluster scope to other climate and environment technology areas under GEF-7.
Relevant Ministries and National Institutions: <ul style="list-style-type: none"> - Ministry of Education, Science, Technology and Innovation - Ministry of Finance and Economic Affairs - Ministry of Agriculture, Food, Fisheries and Water Resource Management 	To mainstream key sustainable energy entrepreneurship and value creation aspects into policies and public instruments, UNIDO and MIICs will closely partner with the other Ministries. The mainstreaming of sustainable energy aspects in promising economic market segments (e.g. tourism, fishery, agro- and food processing, waste management) requires policy coherence. There is also need to coordinate closely on solving coherence issues in the legal and incentive framework which are currently hindering business opportunities in the sustainable energy sector. Regarding the qualification and certification activities close cooperation with the Ministry of Education, Science, Technology and Innovation, and its main partners (e.g. UWI, BCC, SJPI) will established. There are discussions on making common use of the envisaged FAB LAB in the context of the new cluster. In cooperation with the Ministry of Environment a potential nexus-extension of the sustainable energy and climate cluster to other climate adaptation and environmental technology areas are discussed under GEF-7.
Agencies and organisations:	
Energy Unit of the Caribbean Community (CARICOM) and the Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE)	CARICOM and CCREEE will be important partners and co-financiers when it comes to the promotion of innovative sustainable energy and climate innovations in the wider Caribbean. Synergies to the starting sub-regional C-SERMS activities funded by the GIZ, EU, WB and IADB will be established. The promotion of local energy entrepreneurship and innovation is an important part of the C-SERMS activities. CCREEE is in the process to formulate a dedicated sustainable energy entrepreneurship program in this context. Synergies to the regional capacity development, knowledge management and business promotion activities will be created. CCREEE will provide a vehicle for Barbadian sustainable energy entrepreneurs to access new markets in the Caribbean. CCREEE will be also an important executing partner of the cluster to reach out to potential strategic RE and EE investors and financiers on sub-regional and international level.
Civil Society Organizations (CSOs), particularly Local Private Sector Associations	
<ul style="list-style-type: none"> - Barbados Chamber of Commerce and Industry - Barbados Manufacturers Association - Barbados Hotel and Tourism Association - Barbados Small Business Association - Barbados Renewable Energy Association 	MIICs, UNIDO and the cluster management will create close cooperation and a regular dialogue with the associations. Awareness on sustainable energy opportunities will be created. Outreach to and involvement of target sectors and industries. BREA will be an important executing partners regarding component 3 on capacity building. It will be also an important networking partner for more coherent cross-sectoral legislation and incentives.

NGOs and associations that promote gender equality and women's empowerment	Potential CSOs and NGOs, including those focusing on gender equality issues and advocating women's empowerment, such as women's associations, will be consulted and/or involved whenever appropriate during project implementation. Regular consultations with stakeholders and local beneficiaries will ensure that the project's impact on and appropriation by the local communities can be assessed throughout project implementation. NGOs and associations will be represented in the meetings of the strategic partnership and project steering committee.
Academic institutions, schools and training institutes	
<ul style="list-style-type: none"> - University of the West Indies - Cave Hill - Samuel Jackman Prescod Polytechnic - Barbados Community College - AEE-Intec and other international energy technology institutions 	Execution of capacity building and research activities, knowledge accumulation and dissemination management; active participation in the meetings of the strategic partnership; providing inputs on key documents such as the capacity needs assessment and strategy; facilitate cooperation with AEE Intec in the solar-thermal sector;
Private sector, investors	
Institutions and private companies: + Acleron + Megapower + Williams Ind. + Int. business partners (e.g. SOLID)	Selected private companies and investors will be important executing partners and beneficiaries in the context of cluster building and formation of business-to-business technology partnerships (e.g. solar-thermal sector). Some Barbadian companies have already expressed their interest in joining particular working groups of the cluster and have also pledged co-funding for certain activities. For example, Megapower and Acleron intend to partner on the e-mobility nexus and battery storage solutions (ie. Laboratory for battery testing). To expand into new solar thermal technology areas (cooling, large systems) strategic partnerships could be established on international level.

A4. Gender Equality and Women's Empowerment. Elaborate on how gender equality and women's empowerment issues are mainstreamed into the project implementation and monitoring, taking into account the differences, needs, roles and priorities of women and men. In addition, 1) did the project conduct a gender analysis during project preparation (yes /no)?; 2) did the project incorporate a gender responsive project results framework, including sex-disaggregated indicators (yes /no)?; and 3) what is the share of women and men direct beneficiaries (women 40%, men 60%)? ¹⁹

➔ Gender dimension of the project

In general, Barbados has attempted to address many of the barriers for women entrepreneurs. Progress in relation to the gender gap can be assessed using the WEF's Global Gender Gap Report. Almost 44% of firms surveyed indicated that they had a woman participating in ownership, putting Barbados roughly in the middle of the group of comparator countries, and a similar story emerges with regard to the proportion of permanent female full-time workers. Barbados also scored highly in terms of the proportion of female top managers in its firms. The project has the aim to ensure that its benefits will be equally accessible to both men and women. In addition, special efforts will be made to involve NGOs that promote gender equality and women's empowerment as consultants, participants and entrepreneurs in all relevant activities.

¹⁹ Same as footnote 8 above.

A comprehensive gender analysis has been conducted during the PPG phase as part of the SEIMA (see annex). The gender analysis included: in-depth consultation of women in order to tailor the different project components to their needs; interviews with women entrepreneurs (as an especially targeted group) so as to better understand the challenges they faced and the success factors that led them to succeed in order to be able to disseminate them accordingly. The undertaken survey included specific gender related questions. The Institute for Gender and Development Studies (IGDS), hosted at University of the West Indies - Cave Hill Campus, has been thoroughly consulted during the project preparation phase. The origins of this institute remount to 1993 when it started to study the complexity of Caribbean gender relations and systems and its interactions with economic, social, political and cultural systems. In addition, the gender analysis has been also done in close cooperation with the “Island Women Open Network (IWON) for Sustainable Energy & Climate Resilience in Island Nations”.

Based on the findings the gender dimensions of the project outcomes and outputs, as well as potential entry points for gender equality and women's empowerment (GEEW) were explored. Interviews with various stakeholders have highlighted that gender equality and women’s empowerment have not been a significant priority in energy policy and programs. Gender has not been an issue considered in most of the ongoing energy programs. The 30+ years-old solar thermal industry and the RE sector in general has relatively few women-owned businesses and similarly in the industry itself the presence of women-led institutions and businesses is not significant. A shift in the dynamic emerges in the context of MEGAPOWER whose owner and public face is female. She highlights that there are opportunities but female students must be better linked to job opportunities and female entrepreneurship must be systematically encouraged. In many economic key sectors with potential for increased RE use, women are heavily involved (food and beverage, tourism) or heavily involved in some segments of the sector (fisheries i.e. on processing and selling). These findings on the gender dimensions will be used as a guideline during the implementation of the project as well as for the M&E Project Component.

→ Project gender mainstreaming strategy:

The project has the aim to ensure that its benefits will be equally accessible to both men and women. In addition, special efforts will be made to involve NGOs and associations with gender focus as consultants, participants and entrepreneurs in all relevant activities. The guiding principle of the project will be to ensure that both women and men are provided equal opportunities to access, participate in, and benefit from the project, in practical terms:

- Gender-sensitive recruitment will be practiced at all levels where possible, especially in the selection of the project staff: Gender-neutral TORs will be used to mainstream gender in the activities of consultants and experts, encouraging a gender-sensitive recruitment.
- All decision-making processes will consider gender dimensions. At project management level, Project Steering Committee meetings will try to have a gender-balanced composition. Also, at the level of project activity implementation, effort will be made to consult with stakeholders focusing on gender equality issues, being especially relevant in the Project Component 1, under the outputs of policy review and formulation.
- The SEC Facility will undertake at least one call targeting female entrepreneurs;
- To the extent possible, efforts will be made to promote participation of women in training activities, both at the managerial and technical levels. This may include advertising of the events to women's energy/technical associations, for instance.
- When data-collection or assessments are conducted as part of the project implementation, gender dimensions will be considered. Including sex-disaggregated data collection, performing gender analysis, etc. (add other recommendations/guidelines resulting from the gender analysis of the PPG)
- Gender dimensions will be integrated into deliverables of subcontracts through ToRs and JDs of experts to be hired.

A5. Risks. Elaborate on indicated risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, the proposed measures that address these risks at the time of project implementation (table format acceptable):

The overall risk of this proposed project is low to medium as detailed in the below table:

Risk	Rating	Mitigation
<p>Policy Risk: Due to the upcoming national elections in the first quarter of 2018 there is some risk that the new Government might change the policy towards sustainable energy and Barbados as a „green technology hub”.</p>	<i>Low</i>	The risk is relatively low as also the utility and the private sector is highly committed to the 100% renewable energy scenario of Barbados. Moreover, the high costs of energy generation will be a strong incentive for that. Since the component has a strong policy dialogue component this risk will remain low. The GEF project foresees also a cooperation with BREA which has a strong advocacy role in the public.
<p>Involvement Risk: Lack of interest by the public and private sectors in the platform, resulting in limited interest of local players in developing the sustainable energy value chain</p>	<i>Medium</i>	During project design, a consultative and participatory approach has been applied; from the very beginning of the implementation, the ownership of the platform will lie with MIICS and the local key stakeholders; A proper communication strategy will be prepared and implemented with adequate resources allocated to ensure an effective and widespread communication of the platform.
<p>Technical/Capacity risks: Lack of capacity by the national counterpart</p>	<i>Low</i>	The project is in line with national policies and the project will be executed in close coordination with the respective Ministries and authorities;
<p>Management Risk: Lack of effective coordination between various project partners</p>	<i>Low</i>	A proper coordination will be sought through the Project Steering Committee and the strategic platform. Consultation between MIICS and other GEF executing and implementing agencies has already happened during the preparation of this document.
<p>Financial Risk: Incentive and financial support systems are insufficient.</p>	<i>Low</i>	The capacity of financial and governmental institutions will be strengthened for the promotion of innovation and added value creation. Grant instruments will be developed and applied to ensure availability of financing resources.
<p>Climate Change Risk: Negative impacts of climate change</p>	<i>Medium</i>	The potential impact of extreme weather events on the industry-cluster and business models will be studied case by case and capacity will be built around climate resilient technologies. It shall be ensured that developed technology innovations shall be resilient to climate change impacts (e.g. disasters).
<p>Gender Risk: Resistance against or lack of interest in, the project activities from stakeholders, especially with regard to the active promotion of gender equality. Low participation rates of suitable female candidates due to lack of interest, inadequate project activity or missing qualified female population within the i.e. engineering sector.</p>	<i>Low</i>	This Project will pursue thorough and gender responsive communication and ensure stakeholder involvement at all levels, with special regard to involving women and men, as well as CSOs and NGOs promoting GEEW.
<p>Sustainability Risk: There is risk that the cluster cannot be sustained after the closure of the GEF project. The same</p>		The project builds on strong ownership of the counterpart. The execution of the cluster-component by BDC as well as the high co-financing contribution of

might happen regarding the envisaged financing facility.	<i>Medium</i>	BIDC and the Government will ensure that the cluster will continue to operate after the closure of the project. Moreover, the cluster will start to generate its own revenues during the life-cycle of the GEF projects. The receipt of funding from the facility is linked to a membership in the cluster – that will strengthen the membership base of the cluster from the very beginning. Moreover, the cluster will contribute to the sustainability of the funding operations of the facility, since the supported entrepreneurs will get access to other services (e.g. incubation, cooperation with other companies).
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A6. Institutional Arrangement and Coordination. Describe the institutional arrangement for project implementation. Elaborate on the planned coordination with other relevant GEF-financed projects and initiatives.

→ Project implementation

UNIDO is entrusted by the Government of Barbados and by the GEF with the mandate to implement the project and to achieve its objectives, outcomes and outputs within its budget and time frame, as approved in this project document. UNIDO is accountable to the GEF for the funds of this project and will, in close consultation with MIICS, implement the project according to the established UNIDO’s rules and regulations. This means that UNIDO will maintain the oversight on the project implementation, manage the overall project budget, supervise the project execution, as well as organize planned evaluations and conduct monitoring missions. UNIDO will provide execution support for the procurement of goods and services, as well as recruitment of technical experts, in cases where it is decided by the Project Steering Committee (PSC). In such cases, the full or partial title and ownership of equipment purchased under the project may be transferred to national counterparts and/or project beneficiaries during the project implementation as deemed appropriate by the UNIDO Project Manager in consultation with project stakeholders. Finally, UNIDO will support the co-ordination and networking with other related initiatives and institutions in the country and in the region.

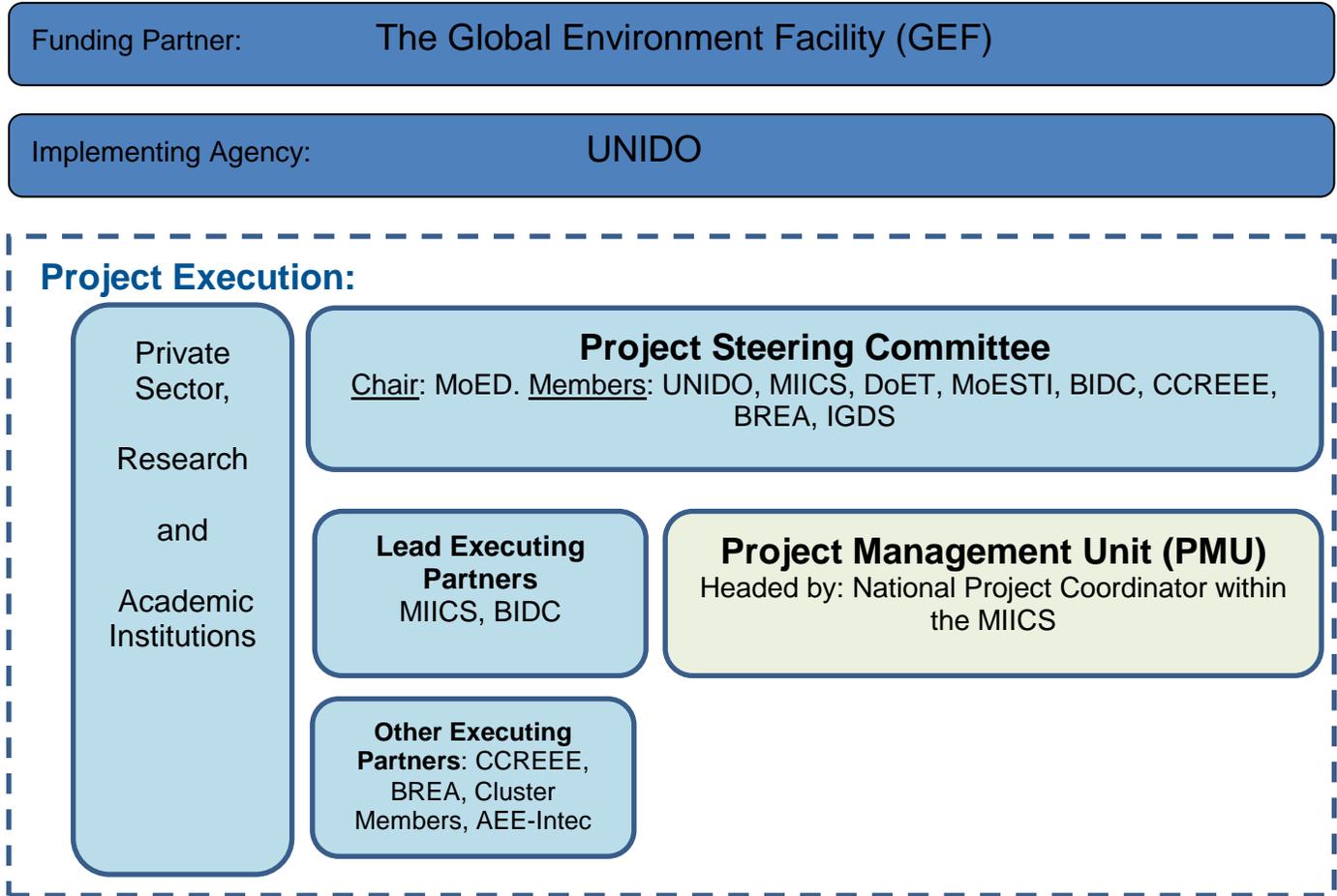
→ Decision-making level

Coordination among Government agencies and the Implementing agency will be achieved through a Project Steering Committee (PSC) which will be co-chaired by MoED. The PSC will provide the necessary guidance and coordination to the project implementation, and will invite members and experts for specific meetings, as needed. The PSC decisions shall be made in line with the approved project document, GEF and UNIDO guidelines. The proposed members of the PSC are:

- Ministry of Environment and Drainage (MoED), as chair and Operational Focal Point of the Global Environment Facility (GEF) in Barbados;
- Ministry of Industry, International Business, Commerce and Small Business Development (MIICS), as host of the PMU and coordinator of the dialogue platform, as co-chair.
- Representative of UNIDO’s Department of Energy,
- Energy and Telecommunications Division at Office of the Prime Minister (DoET), as main responsible entity for energy policy and related programs;
- The Ministry of Education, Science, Technology and Innovation, as important partner regarding the execution of the capacity building component;
- The Barbados Investment Development Corporation (BIDC) as manager of the sustainable energy and climate technology cluster component;
- The Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE) as linking-partner to the Caribbean;

- The Barbados Renewable Energy Association (BREA) as representative of the private sector;
- The Institute for Gender and Development Studies (IGDS), hosted at University of the West Indies, Cave Hill Campus

Figure 17: Implementation and execution structure of the GEF project



The PSC will operate in line with the approved project document and GEF guidelines and responsible for:

- dealing with the coordination, planning and implementation of the project activities
- acting as a discussion forum for proposed activities, policies and initiatives related to the project development or modification
- reviewing the advances and obstacles, and taking decisions on strategic and/or critical issues
- coordinating and managing the overall project activities at a macro level
- facilitating coordination of project activities across institutions
- reviewing the project activities and their adherence to the work plan set forth in the project document, in line with the GEF regulations on major and minor amendments (GEF/C.52/Inf.06/Rev.01)
- reviewing and commenting on each year's proposed work plan and budget
- Requesting and reviewing financial and progress reports
- taking decisions on the issues brought to its notice by UNIDO and other cooperating institutions, and considering any advice regarding the efficient and timely execution of the project

- initiating remedial action to remove impediments in the progress of project activities that were not envisaged earlier

→ Project execution

The Project Management Unit (PMU) that will be established by MIICS in close coordination with UNIDO and other partners. MIICS has confirmed co-funding for the coordinator in the PMU. UNIDO will supervise the operation of the PMU. The PMU will comprise of a National Project Coordinator (NPC) which will closely coordinate with UNIDO and the BIDC management of the sustainable energy and climate cluster. The PMU is responsible for the day-to-day management of project activities and for the coordination of stakeholders. The NPC will be responsible for:

- coordinating the management and execution activities of the project as set out in the project document in close partnership with the cluster manager;
- coordinating the project execution with relevant stakeholders and participating organizations;
- reviewing the ToRs for project team member, including consultants and contracting/subcontracting agencies;
- organizing tripartite review meetings as per UNIDO procedures. Preparing Annual Project Reports (APR) and other relevant reports for submission to UNIDO and PSC. Chair the PMU monthly meetings. Providing guidance to the PSC for execution and adhering to the planned milestones and to ensure that project activities conform to the agreed project document;
- helping PSC to ensure that project activities are completed in accordance to the agreed project document;
- coordinating and supervising the work carried out by project consultants/contractors (international & national). Reviewing consultant's reports, project budget revisions and all other administrative arrangements required as per national and UNIDO procedures;
- preparing the project annual work plan and budget as well as its timely submission;
- submitting regular progress reports to UNIDO;

The majority of activities of the GEF Project will be executed through execution partners. The main execution partner for the technology cluster will be BIDC. BIDC has confirmed substantial co-funding for cluster and will provide also the hub infrastructure. The cluster management, comprising a manager and an assistant, will closely coordinate with the PMU coordinator and UNIDO. The cluster recruitments will be jointly funded by GEF and BIDCs. The assistant of the cluster will work under a UNIDO ISA contract arrangement. Other project components will be executed through other partners (e.g. CCREEE, BREA, contractors). The particular role of the partners is better described in the section on *stakeholders*.

Coordination

The dialogue platform and the cluster hub will have regular coordination meetings and that will interconnect a broad range of different public and private stakeholders. The GEF project complements and creates strong links to the ongoing sustainable energy support programs of IADB, EU, UNDP and GIZ as mentioned in the section "Baseline projects".

Communication

UNIDO and GEF logos must be inserted in all the relevant project publications in recognition of the inputs they made to the project. Any citation of the publications related with projects financed by GEF must acknowledge the role played by GEF.

Additional Information not well elaborated at PIF Stage:

A7. *Benefits.* Describe the socioeconomic benefits to be delivered by the project at the national and local levels. How do these benefits translate in supporting the achievement of global environment benefits (GEF Trust Fund) or adaptation benefits (LDCF/SCCF)?

The project is expected to deliver tangible socio-economic benefits for the Barbadian energy sector, as well as for individual businesses and the men, women and their families involved. Through the strengthening of the private sector capacities, a major barrier for the further uptake of the RE and EE market will be mitigated. The macro-economic benefits at national level (country) are achieved as a result of avoided imports of fossil fuels for electricity generation and heat applications. Moreover, through the strengthening of the local businesses in technology areas with high value creation potential new jobs and turnover will be created. It is estimated that through the project intervention the current employment rate of 200 full time equivalents (FTE) in the sustainable energy sector would double in 5 years to about 400 FTE in total. It is estimated that around 40% of these jobs could be theoretically occupied by women. In terms of environmental benefits, through the annual displaced fossil fuel power generation, the direct emission reduction is estimated to be 82,000t in four years. The project social benefits include also the building of technical capacities.

The overall scope of the cluster concept also responds to several sustainable development goals, principally SDG 7 – ensure access to affordable, reliable, sustainable and modern energy for all; SDG 9 – build resilient infrastructure, promote sustainable and inclusive industrialization and foster innovation; SDG 12 – ensure sustainable consumption and production patterns; SDG 13 – take urgent action to combat climate change and its effects. Indirectly, the project has implications for SDG 1 (end poverty in all its forms everywhere) particularly target 1.5 to “By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters”²⁰, SDG 5 (achieve gender equality and empower all women and girls), particularly target 5.5 to “Ensure women’s full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life” and SDG 8 (promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all), particularly targets 8.2 “achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors” and 8.3 “promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services”.

A8. *Knowledge Management.*

Knowledge management is inherent to UNIDO’s operating modality by sharing experiences across its interventions worldwide. This has been demonstrated through many high-quality publications, organization of events, webinars, and more. Access to specialised knowledge on technologies and business tools, market intelligence, qualification and certification, as well as specialized R&D facilities for prototyping has been identified as a major barrier for sustainable energy entrepreneurs in Barbados. The proposed GEF project is

²⁰ <https://sustainabledevelopment.un.org/topics/sustainabledevelopmentgoals>

addressing this key barrier throughout its components. The creation of the cluster will formalize communication between companies and create an enabling environment for knowledge exchange and joint R&D activities on innovative solutions. The cluster will develop a strong knowledge management towards its members and also with external partners. Also, the dialogue platform and its annual policy dialogues will contribute to knowledge management.

The involvement of CCREEE will ensure knowledge transfer to and from the Caribbean region. The results of the project will be disseminated through the CCREEE knowledge system. Moreover, SIDS-SIDS knowledge exchange on sustainable energy entrepreneurship will be created in partnership with the other regional sustainable energy centers based in Tonga (PCREEE) and Cape Verde (ECREEE). CCREEE is part of a UNIDO promoted SDG-7 partnership, which aims at the creation of a network of regional sustainable energy centers for SIDS in Africa, Pacific, Caribbean and Indian Ocean. The sub-network is part of the Global Network of Regional Sustainable Energy Centers. The GEF project will also create strong links to other platforms such as provided by the BRIDGE project.

B. Description of the consistency of the project with:

B.1 Consistency with National Priorities. Describe the consistency of the project with national strategies and plans or reports and assessments under relevant conventions such as NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc.:

The proposed project is in line with the major national policies and programs on sustainable energy technologies and SME development in Barbados. Specifically, the project will actively contribute to the below listed policies through its policy, capacity and business promotion focused activities:

- Barbados Nationally Determined Contribution – NDC (2016)
Barbados has signed and ratified the Paris Climate Agreement on 22 April 2016 (which does not include new updates from the INDC previously submitted). The proposed project is consistent with Barbados' Nationally Determined Contribution, particularly in the objectives related to climate change adaptation and mitigation in supporting green economic and social development. The GEF Project contributes directly to the RE and EE targets in the NDC and has important cross-links to the proposed implementation mechanisms.
- Final Draft: Barbados National Energy Policy (BNEP, 2017-2037)
The Barbados National Energy Policy vision statement is: “Energy security and affordability through diversity and collaboration: Establishing and maintaining a sustainable energy sector for Barbados”, and it has 8 Visionary Goals to articulate its implementation, being the Visionary Goal 6: Entrepreneurship; where the Cluster will play a key role during its implementation phase.
- Resource Efficient Low Carbon and Circular Industrial Partnership Platform for Catalysing Eco-Innovation and Entrepreneurship in Barbados (RECIPPE-Barbados, 2014)
The project is implemented under the umbrella of the joint declaration “Resource Efficient Low Carbon and Circular Industrial Partnership Platform for Catalysing Eco-Innovation and Entrepreneurship in Barbados (RECIPPEE-Barbados)”, which is also part of the NDC. The declaration was signed between UNIDO and the GoB during the Third International Conference on Small Island Developing States, held from 1 to 4 September 2014 in Apia, Samoa. The partnership between UNIDO and the GoB on the CCREEE, also falls under this declaration.

Moreover, this project is consistent with Barbados's National Climate Change Policy and Sustainable Development Policy that provides the strategies and guidelines for developing a society that promotes its human

resources and develops a green economy. Specifically, the project is in accord with the following national and regional strategies:

- o Medium Term Growth and Development Strategy 2013 – 2020
- o Human Resource Development Strategy 2011-2016
- o The Barbados Sustainable Development Policy
- o The CARICOM Energy Policy and Climate Change Framework
- o The CARICOM Declaration for Climate Action 2015
- o C-SERMS and SIDS DOCK targets
- o Green Economy Scoping Study

C. DESCRIBE THE BUDGETED M&E PLAN:

UNIDO as the Implementing Agency will involve the GEF Operational Focal Point and project stakeholders at all stages of the project monitoring and evaluation activities in order to ensure the use of the evaluation results for further planning and implementation. According to the Monitoring and Evaluation policy of the GEF and UNIDO, follow-up studies like Country portfolio evaluations and thematic evaluations can be initiated and conducted. All project partners and contractors are obliged to (i) make available studies, provide reports or other documentation related to the project and (ii) facilitate interviews with staff involved in the project activities.

Project monitoring and evaluation (M&E) will be conducted in accordance with established UNIDO and GEF procedures. The overall objective of the monitoring and evaluation process is to ensure successful and quality implementation of the project by:

- i) tracking and reviewing project activities execution and actual accomplishments;
- ii) providing visibility into progress as the project proceeds so that the implementation team can take early corrective action if performance deviates significantly from original plans;
- iii) adjusting and updating project strategy and implementation plan to reflect possible changes on the ground, results achieved and corrective actions taken.
- iv) Ensure linkages and harmonization of project activities with that of other related projects at national, regional and global levels.

According to the Monitoring and Evaluation policies of the GEF and of UNIDO, follow-up studies like Country Portfolio Evaluations and Thematic Evaluations can be initiated and conducted. All project partners and contractors are obliged to (i) make available studies, reports and other documentation related to the project and (ii) facilitate interviews with staff involved in the project activities.

At the same time, M&E will comply with the rules and regulations governing the M&E of UNIDO technical cooperation projects, in particular the UNIDO Evaluation Policy and the Guidelines for Technical Cooperation, both in their respective current versions.

A detailed monitoring plan for tracking and reporting on project time-bound milestones and accomplishments will be prepared by UNIDO in collaboration with the PMU and project partners at the beginning of project implementation and then periodically updated. By making reference to the impact and performance indicators defined in the Project Results Framework, the monitoring plan will track, report on and review project activities and accomplishments in relation to:

- a. Overall and specific socio-economic impacts and gender related aspects (such as gender balance of beneficiaries, budget spent on activities actively promoting GEEW).
- b. GHGs emission reductions directly and in-directly generated by the proposed project. These will include the type and the number of projects developed and implemented.

Project Kick off

A Project Inception Workshop (IW) will be held within the first 2 months after the project inception, involving those with assigned roles in the project organization structure. The IW is crucial to build ownership for the project results and to plan the first year annual work plan. The IW has the following objectives:

- Assist all partners to fully understand and take ownership of the project objectives, outputs and activities. Detail the roles, support services and complementary responsibilities of local stakeholders in relation with the PMU.
- Ensure that all stakeholders are aware of the roles, functions and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. The terms of reference (ToRs) for project staff will be reviewed again as needed;
- Based on the project results framework, finalize the first annual work plan. Review and agree on the indicators, targets and their means of verification and revise assumptions and risks.
- Elaborate the M&E work plan, in accordance with the proposed budget, including a detailed overview of reporting, M&E requirements, as well as a gender analysis.
- Review financial reporting procedures and obligations, and arrangements for annual audit.
- Plan and schedule PSC meetings. Roles and responsibilities of all project organization structures should be clarified and meetings planned.

The first PSC meeting should be held within the first 12 months following the IW. An IW report is a key reference document and must be prepared and shared with participants to formalize various agreements and plans decided during the meeting.

KPIs

Monitoring and reporting procedures shall be established against/from Key Performance Indicators (KPIs) against which the project progress will be measured during quarterly, annual, mid-term and final reviews. These indicators are presented in Annex A, based on Result Based Framework approach and the reporting requirements of the GEF Climate Change Tracking tool (CC TT). The completed GEF CC TT will be submitted at the design and final project phases. During the project preparatory phase, a gender analysis will be conducted. Monitoring and reporting will be done against the following sex disaggregated indicators:

Number of stakeholders with increased awareness of energy management principles

- Number of trained local practitioners in system optimization active in the industry

Annual Project Review (APR)

These key reports aim to monitor progress made since the project inception and in particular what has been accomplished since the previous reporting period. The APR includes, but is not limited to, reporting on the following:

- Progress made toward project objectives and outcomes, based on the indicators, baseline data and project completion goals(cumulative)
- Project outputs delivered per project outcomes (annual)
- Lesson learned/good practice
- Expenditure reports
- Risk and adaptive management
- Portfolio level indicators

Mid-term Review (MTR) of project cycle

An internal assessment will be conducted by the PMU and the PM halfway through the project implementation, and taking into consideration UNIDO guidelines. It will focus on the effectiveness, efficiency and timeliness of project implementation; it will highlight issues requiring decisions and actions; and will present initial lessons

learned from project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term.

End of Project

An independent Final Evaluation will take place three months prior to the final PSC meeting in accordance with UNIDO and GEF guidance/guidelines. The Final Evaluation will focus on the delivery of the project results as initially planned. The final evaluation focuses on the generated outcomes in correspondence with the initially planned (as corrected after the mid-term evaluation, if any such correction took place). The final evaluation will analyse the impact and sustainability of results/the outcomes, including the contribution to capacity development and the achievement of global environmental benefits/goals. The TORs for this evaluation will be prepared by the UNIDO Project Manager based on guidance from the UNIDO evaluation group. The final review will also include the GEF CC TT submission/use.

According to the M&E policy of the GEF and UNIDO, follow-up studies such as Country Portfolio Evaluations and Thematic Evaluations can be initiated and conducted. All project partners and contractors are obliged to facilitate (i) access to studies, reports and other documentation related to the project and (ii) interviews with staff involved in the project activities.

The final evaluation should also provide recommendations for follow-up activities and require a management response. During the last quarter the project team will prepare the Project Terminal Report. This comprehensive report will summarize the results achieved (objectives, outcomes, outputs), lessons learned, problems met and areas where results may not have been achieved. It will also lay out recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the project results.

Costs of M&E Activities

Type of M&E Activity	Responsible Partner	GEF Budget (USD)	Co-financing Budget (USD)	Remarks	Timeframe
Inception Workshop (IW) and inception report	UNIDO Project Manager (PM); Project Management Unit (PMU)	5,000	0	It will be part of PMU activity	Within first two months of project start up
M&E design and tools to collect and record data (performance indicators) including a survey to confirm baseline values for technical capacities, gender, etc.	UNIDO PM, PMU and M&E and gender specialists as required	5,000	5,000		Within first two months of project start up and mid project
Regular monitoring and analysis of performance indicators (technical, social, environmental, gender)	UNIDO Project Manager (PM); PMU and M&E specialists as required	0	30,000	It will be part of PMU activity	Regularly to feed into project management and Annual Project Review
Project Implementation Reviews (PIRs)	PMU to prepare prior to the annual project review PM UNIDO to validate and finalize to submit to GEF	0	0	It will be part of PMU activity	Annually
Annual Project Review to assess project progress and performance	PMU, PM UNIDO HQ and Project Steering Committee to review	0	20,000	It will be part of PMU activity	Annually prior to the finalization of

Type of M&E Activity	Responsible Partner	GEF Budget (USD)	Co-financing Budget (USD)	Remarks	Timeframe
	the project performance and make corrective decision				APR/PIR and to the definition of annual work plans
Steering Committee Meeting (SC)	PMU, PM UNIDO HQ and Project Steering Committee	0	0	It will be part of PMU activity	Annually to coincide with the Annual Project Review and ad hoc when urgent and important decisions need approval of SC
Mid-term review including survey to measure progress against baseline for investments, trainings and policy makers	UNIDO PM, UNIDO	10,000	0	Voluntary	Mid of project
Project Terminal Evaluation	UNIDO Independent Evaluation Division (EVQ/IEV), PMU, PM UNIDO HQ and Project Steering Committee, independent external evaluators	30,000	30,000	Indicative cost	Evaluation at least one month before the end of the project; report at the end of project implementation
Lessons learned (in annual project review and PIRs, publication)	PMU, external consultants, UNIDO PM	N/A	45,000	It will be part of PMU activity	Three months before the last PSC
TOTAL indicative cost		50,000	130,000		

Legal context

It is expected that each set of activities to be implemented in the target countries will be governed by the provisions of the Standard Basic Cooperation Agreement concluded between the Government of the recipient country concerned and UNIDO or – in the absence of such an agreement – by one of the following: (i) the Standard Basic Assistance Agreement concluded between the recipient country and UNDP, (ii) the Technical Assistance Agreements concluded between the recipient country and the United Nations and specialized agencies, or (iii) the Basic Terms and Conditions Governing UNIDO Projects.”

PART III: CERTIFICATION BY GEF PARTNER AGENCY(IES)

A. GEF Agency(ies) certification

This request has been prepared in accordance with GEF policies²¹ and procedures and meets the GEF criteria for CEO endorsement under GEF-6.

Agency Coordinator, Agency Name	Signature	Date (MM/dd/yyyy)	Project Contact Person	Telephone	Email Address
Mr. Philippe R. Scholtès, Managing Director, Programme Development and Technical Cooperation (PTC), UNIDO GEF Focal Point		03/28/2018	Mr. Martin Lugmayr, Sustainable Energy Expert, Climate Policy and Partnerships Division, Department of Energy	+43/(0)1 26026 3595	M.Lugmayr@unido.org

²¹ GEF policies encompass all managed trust funds, namely: GEFTF, LDCF, SCCF and CBIT

ANNEX A: PROJECT RESULTS FRAMEWORK

PROJECT STRATEGY	OBJECTIVELY VERIFIABLE INDICATORS	INDICATOR (QUANTIFIED AND TIME-BOUND)	BASELINE	TARGET	SOURCE OF VERIFICATION	ASSUMPTIONS/RISKS
Project Objective	Enhanced GHG emission reduction and domestic value creation through the strengthening of the sustainable energy and climate technology manufacturing and servicing industry in Barbados	<p>Strengthened capacities of the SEC industry lead to direct GHG (in tons of CO₂e) emission reduction over the project duration of 4 years</p> <p>Indirect GHG emission reduction over a period of 20 years (% contribution of the project to the advanced NDC scenario)</p> <p>% annual increase of the turn-over of the SEC technology industry in Barbados (e.g. through increased sales, contracts) over a period of five (5) years</p> <p>Number of additional primary and secondary jobs (full time equivalents (FTE) in the SE industry created over a period of five (5) years (overall 400 jobs (FTE) in the sector after five years) (at least % occupied by women is envisaged)</p>	<p>In the NDC BAU scenario, GHG emissions will reach approximately 2,400 Mt CO₂ eq. by 2026. In the advanced „with intervention “scenario, GHG emissions are estimated at 1,450 Mt CO₂ eq. by 2026.</p> <p>Indicator for the current turn-over will be confirmed during the inception meeting</p> <p>200 jobs - full time equivalents (FTE) - currently in the SE sector;</p>	<p>Direct GHG emission reduction of 82,000 tons over 4 (four) years in Barbados</p> <p>Indirect GHG emission reduction of 3.2 million tons of CO₂e over the next 20 years (20% contribution of the project to the advanced NDC scenario)</p> <p>5% annual increase of the turn-over of the SEC technology industry in Barbados (e.g. through increased sales, contracts) over a period of five (5) years</p> <p>200 additional primary and secondary jobs (full time equivalents (FTE) in the SE industry created over a period of five (5) years (overall 400 jobs (FTE) in the sector after five years) (at least 40% occupied by women is envisaged)</p>	<p>Industry reports</p> <p>Energy reports</p> <p>GHG emission statistics</p> <p>Provided company and tax information</p>	<p>Continued fluctuating fossil fuel prices remain an energy security concern and burden for national and private-sector budgets in Barbados and the entire Caribbean</p>
PROJECT COMPONENT 1 – POLICY AND REGULATORY FRAMEWORK						
Outcome 1.1	Enhanced market opportunities for SEC businesses through a coherent policy, regulatory and incentive framework and improved public-private coordination	% annual demand increase for SEC services and technologies in key economic sectors (e.g. generation and distribution of power and energy services, construction, fisheries and agro-processing, tourism,	<p>Stagnating demand for SECs due to policy and regulatory issues (e.g. solar-thermal, LED lighting, EE in buildings and appliances)</p> <p>Low satisfaction of</p>	5% annual demand increase for SEC services and technologies in key economic sectors (e.g. generation and distribution of power and energy services, construction, fisheries and agro-processing, tourism, transport, waste management, as well as	<p>Market reports</p> <p>Sale statistics</p> <p>Tax statistics</p> <p>Survey</p> <p>Policy and legal documents</p>	Continued fluctuating fossil fuel prices create demand for SEC technologies in Barbados and the wider Caribbean

PROJECT STRATEGY	OBJECTIVELY VERIFIABLE INDICATORS	INDICATOR (QUANTIFIED AND TIME-BOUND)	BASELINE	TARGET	SOURCE OF VERIFICATION	ASSUMPTIONS/RISKS
		transport, waste management, as well as water/desalination) Satisfaction of the SECs industry with the adapted policy, regulatory and incentive framework after 5 years	the private sector with the current policy, regulatory and incentive framework	water/desalination) over 5 years Satisfaction of the SECs industry with the adapted policy, regulatory and incentive framework after 5 years		
Output 1.1.1	A dialogue platform to promote sustainable energy and climate innovation, entrepreneurship and industrial development is fully operational	Public-private dialogue platform is operational Number of private and public platform members (at least % female) Number of meetings and consultations to discuss policy and legal key issues	Weak coordination and communication on SE industry issues: between Ministries between businesses between public and private sector	Platform is operational At least 50 platform members (it is envisaged that 40% are represented by women) 20 meetings and consultations to discuss policy and legal key issues organized	Meeting minutes Rules of the platform Lists of meeting participants	High interest in coordinating on SEC issues
Output 1.1.2	A vision statement and strategy to promote the country as a hub for SEC technologies and services is developed and promoted abroad through various means	Vision statement and strategy for the “B-Greentech” hub as part of the National Plan vision Off- and online promotion material disseminated in various sectors (e.g. tourism)	Currently, no real vision statement and marketing of Barbados as a hub for SEC technologies Barbados is not promoted systematically as hub	Vision statement and strategy developed (a gender dimension will be included) At least 80% of the foreseen activities in the strategy implemented during the project duration Promotion material disseminated in at least 5 different sectors (a gender dimension will be included)	Vision statement Strategy Dissemination material Distribution lists	Continued interest of the Government in RE&EE despite electoral changes
Output 1.1.3	Annual high-level policy dialogues on sustainable energy and climate industry issues are organized	Number of high-level policy dialogues organized Number of CEOs and senior officials participated in the dialogues (at least % female)	No high-level policy dialogues on SE industry and entrepreneurship	At least three (3) high-level policy dialogues are organized At least 200 national, regional and international senior officials of the public and private sector (businesses, banks, investors) participate in the dialogues (participation of	Meeting documentation List of participants	Continued high interest in sustainable energy industry issues

PROJECT STRATEGY	OBJECTIVELY VERIFIABLE INDICATORS	INDICATOR (QUANTIFIED AND TIME-BOUND)	BASELINE	TARGET	SOURCE OF VERIFICATION	ASSUMPTIONS/RISKS
				40% women participation is envisaged)		
Output 1.1.4	Demand creating and supplier oriented proposals to improve the coherence and effectiveness of policies and legislation are formulated and under implementation	<p>Number of proposals developed and discussed in policy and legislative processes</p> <p>Number of demand-creating and supplier-oriented policies, laws or standards on SEC technologies approved and under implementation</p> <p>Number of inputs to mainstream SEC technologies into cross-cutting policies in key economic sectors (e.g. generation and distribution of power and energy services, construction, fisheries and agro-processing, tourism, transport, waste management, as well as water/desalination)</p>	Contradictive policies and incentives (see baseline analysis) hinder the uptake of SEC technologies and limit business opportunities for domestic entrepreneurs	<p>At least 30 proposals developed and discussed in policy and legislative processes</p> <p>At least 10 of demand-creating and supplier-oriented policies, laws or standards on SEC technologies are approved and their implementation facilitated</p> <p>At least ten (10) inputs to mainstream SEC technologies into cross-cutting policies in key economic sectors (e.g. generation and distribution of power and energy services, construction, fisheries and agro-processing, tourism, transport, waste management, as well as water/desalination)</p>	Policy documents, laws and regulations	Continued interest of the Government in RE&EE despite electoral changes
PROJECT COMPONENT 2 – INVESTMENT AND BUSINESS PROMOTION						
Outcome 2.1	Increased investments into the domestic sustainable energy servicing and manufacturing industry in technology areas with high GHG emission and value creation potential	% increase of annual investments in sustainable energy and climate technology businesses by project end (baseline 2017)	Low investments in the domestic manufacturing and servicing industry	5% increase of annual investments in sustainable energy and climate technology businesses (baseline 2017)	Industry reports Energy reports statistics Company and tax information	Continued fluctuating fossil fuel prices create demand for SEC technologies in Barbados and the wider Caribbean
Output 2.1.1	A sustainable energy and climate technology cluster hub	One (1) technology cluster operational	Lack of cooperation between companies	At least 1 technology cluster is fully operational	Annual reports of the cluster	Continued fluctuating fossil fuel prices create

PROJECT STRATEGY	OBJECTIVELY VERIFIABLE INDICATORS	INDICATOR (QUANTIFIED AND TIME-BOUND)	BASELINE	TARGET	SOURCE OF VERIFICATION	ASSUMPTIONS/RISKS
	is created and provides effective services to its expanding member base	<p>Number of working groups established after 5 years</p> <p>Guided tours for at least (number) participants to the cluster and SEC demonstration sites organized (tourists, delegations)</p> <p>Number of paying cluster members after 5 years</p> <p>Number of prototypes and business ideas developed and tested after 5 years</p> <p>USD of funding for the activities of the cluster raised by the cluster management after 5 years</p> <p>USD of raised investment for business ideas developed in the scope of the cluster (committed not contracted) after 5 years</p> <p>Biannual sustainable energy and climate technology survey and industry report</p> <p>% of satisfaction with the services of the cluster services by its members after 5 years (survey)</p>	<p>in the sector</p> <p>No formalised strong cooperation between businesses in the moment (expect from BREA)</p> <p>Lack of start-up support in the sector</p> <p>No collaborative R&D and prototyping in the moment</p> <p>Lack of test labs and maker space</p> <p>No data gathering on the industry and no reports to attract investors</p>	<p>At least 10 private sector working groups established after 5 years (at least 40% women participation is envisaged)</p> <p>Guided tours for at least 150 participants to the cluster and SEC demonstration sites organized (tourists, delegations)</p> <p>At least 30 contributing private-sector cluster members after 5 years (at least 40% women participation is envisaged)</p> <p>At least 5 prototypes and business ideas developed and tested after 5 years</p> <p>At least USD 4 million of funding for the activities of the cluster raised by the cluster management</p> <p>At least 10 million USD of raised investment for business ideas developed in the scope of the cluster (committed not contracted) after 5 years</p> <p>Biannual sustainable energy and climate technology survey and industry report prepared and distributed</p> <p>At least 70% of satisfaction with the services of the cluster services by its members after 5 years (survey)</p>	<p>Industry reports</p> <p>Energy reports statistics</p> <p>Company and tax information</p>	<p>demand for SEC technologies in Barbados and the wider Caribbean</p>

PROJECT STRATEGY	OBJECTIVELY VERIFIABLE INDICATORS	INDICATOR (QUANTIFIED AND TIME-BOUND)	BASELINE	TARGET	SOURCE OF VERIFICATION	ASSUMPTIONS/RISKS
Output 2.1.2	A dedicated financing facility provides grants and concessional loans for the commercialisation of business ideas and innovations developed in the scope of the cluster	<p>Number of calls for proposals of the facility on technology priority areas implemented</p> <p>Number of specific calls for women entrepreneurs undertaken</p> <p>Amount of USD of facility funding contracted and implemented (in USD) after five (5) years</p> <p>Number of businesses supported through grants and/or concessional loans after five (5) years</p>	Lack of funding for start-ups and SEC ideas and technologies (Private Sector Assessment)	<p>At least 3 calls for proposals of the facility on technology priority areas implemented</p> <p>At least 1 specific call for women entrepreneurs undertaken</p> <p>USD 2 million of facility funding contracted and implemented (in USD) after five (5) years</p> <p>At least 30 businesses supported through grants and/or concessional loans after five (5) years</p>	Annual reports of the facility Company and tax information	<p>Financing for the facility is available as planned</p> <p>Sufficient interest of local businesses</p>
Output 2.1.3	A business match-maker provides market intelligence and interlinks cluster members with technology companies, investors and venture capitalist in the Caribbean, the diaspora and internationally	<p>Number of business intelligence briefs on key SEC growth market areas in the Caribbean are available for cluster members</p> <p>Number of SEC match-making and/or investment forums organised in the Caribbean</p> <p>Number of Barbadian businesses participate in Caribbean and international match-making and/or investment forums (at least % female)</p> <p>Number of consolidated business partnerships between Barbadian and Caribbean or international companies in the scope of the cluster are created</p>	<p>Lack of systematic investor and business match-making in the SEC sector</p> <p>Only a very small number of Caribbean business to business partnerships in the SEC sector</p>	<p>At least 5 business intelligence briefs on key SEC growth market areas in the Caribbean are available for cluster members</p> <p>At least 3 SEC match-making and/or investment forums are organised in the Caribbean</p> <p>At least 40 Barbadian businesses participate in match-making and/or investment forums (at least 40% female participation is envisaged)</p> <p>At least five (5) consolidated business partnerships between Barbadian and Caribbean or international companies in the scope of the cluster are created</p>	Business intelligence briefs Meeting reports Documentation on business partnerships	Continued fluctuating fossil fuel prices create demand for SEC technologies in Barbados and the wider Caribbean

PROJECT STRATEGY	OBJECTIVELY VERIFIABLE INDICATORS	INDICATOR (QUANTIFIED AND TIME-BOUND)	BASELINE	TARGET	SOURCE OF VERIFICATION	ASSUMPTIONS/RISKS
PROJECT COMPONENT 3 – CAPACITY BUILDING AND KNOWLEDGE MANAGEMENT						
OUTCOM E 3.1	Enhanced innovation and implementation capacities of sustainable energy businesses in technology areas with high GHG emission reduction and value creation potential	Reported accelerated implementation of SE support programs through improved private sector capacities after five (5) years Annual % increase in the use of domestic contractors, services and content throughout the value chain of SE investments Number of SE patents submitted for registration after five (5) years	Slow progress of the two major SE promotion programs due reported lack of private sector capacities Relatively high import dependence in some SE sectors Very low level of SEC patents submitted	Reported accelerated implementation of SE support programs through improved private sector capacities after five (5) years Annual 3% increase in the use of domestic contractors, services and content throughout the value chain of SE investments At least 3 SE patents submitted after five (5) years	Survey Project documents Statistic on trainings List of registered patents	Continued fluctuating fossil fuel prices create demand for SEC technologies in Barbados and the wider Caribbean
Output 3.1.1	Proposals for improved product, service and qualification standards and certifications are formulated (e.g. PV, solar-thermal buildings, appliances)	Number of proposals for improved product, service and qualification standards and certifications are formulated Number of qualification and certification standards in priority technology areas are adopted and their application is facilitated	Currently no qualification and certification standards for training in the SE sector Currently no standards for SE product and service certification in place (e.g. solar-thermal systems, PV installation)	At least 10 proposals for improved product, service and qualification standards and certifications are formulated At least 5 qualification and certification standards in priority technology areas are adopted and their application is facilitated	Policy documents, laws and regulations, standards	Continued fluctuating fossil fuel prices create demand for SEC technologies in Barbados and the wider Caribbean
Output 3.1.2	One (1) on-line training program on sustainable energy island solutions is developed and applied by educational institutions and experts in Barbados	Online-training program operational Number of institutions include the tool in the curricula Number of Barbadians have taken the online-training (at least % women participation is envisaged)	Currently only very few island-specific training tools in Barbados available	Online-training program operational At least 5 institutions use the tool in their curricula At least 100 Barbadians have taken the online-training (at least 40% women participation is envisaged)	Online-portal Online-user statistics	Continued fluctuating fossil fuel prices create demand for SEC technologies in Barbados and the wider Caribbean

PROJECT STRATEGY	OBJECTIVELY VERIFIABLE INDICATORS	INDICATOR (QUANTIFIED AND TIME-BOUND)	BASELINE	TARGET	SOURCE OF VERIFICATION	ASSUMPTIONS/RISKS
Output 3.1.3	At least 300 experts from various sectors are trained through national and sub-regional trainings, by train-the-trainer approaches and training missions	<p>Number of trainers trained in key technology areas</p> <p>Number of experts from various sectors are trained in priority technology and skill areas (at least % women participation is envisaged)</p> <p>Number of entrepreneurs (incl. cluster management) participating in training missions to international cluster/technology hubs focusing on solutions with high GHG emission reduction and value creation potential (e.g. solar-thermal, efficient buildings) (at least % women participation is envisaged)</p>	<p>SEC capacity building more ad-hoc</p> <p>Lack of certified trainers and trainings available in SEC priority areas</p> <p>Lack of knowledge transfer in some priority areas</p>	<p>At least 50% of the trained trainers provide regular trainings to others either as a free-lancer or as trainer of an institution</p> <p>At least 300 experts from various sectors are trained in priority technology and skill areas (at least 40% women participation is envisaged)</p> <p>At least (five) 30 entrepreneurs (including cluster management) are participating in training missions to international cluster/technology hubs focusing on solutions with high GHG emission reduction and value creation potential (e.g. solar-thermal, efficient buildings) (at least 40% women participation is envisaged)</p>	<p>Training documentation</p> <p>List of participants</p> <p>Documentation on training missions</p>	Continued fluctuating fossil fuel prices create demand for SEC technologies in Barbados and the wider Caribbean
Output 3.1.4	At least two R&D partnerships between companies of the cluster and domestic and/or international applied research institutions are created and under execution	<p>Number of R&D partnerships on technology priorities created</p> <p>Number of prototypes and business ideas developed and under testing</p>	Currently no R&D partnerships	<p>2 (two) R&D partnerships on technology priorities created</p> <p>At least two (2) prototypes and business ideas developed and under testing</p>	<p>Documentation on partnerships</p> <p>Signed agreements</p> <p>Funding documentation</p> <p>Patents</p>	Continued fluctuating fossil fuel prices create demand for SEC technologies in Barbados and the wider Caribbean
PROJECT COMPONENT 4 - MONITORING AND EVALUATION						
OUTCOM E 4.1	Project's progress towards objectives continuously monitored and evaluated	Timely implementation of the project and project targets and indicators properly monitored throughout the project duration	N/A	Project progress and an overall project impact assessment periodically monitored and evaluated	Evaluation Reports Monitoring Reports Lessons learnt report	Capability and experience of project management unit Government and private sector are interested in the fact and figures
Output	Project monitoring and	List of all progress reports	N/A	M&E Plan ready within 3	Progress Reports	Appropriate capability of

PROJECT STRATEGY	OBJECTIVELY VERIFIABLE INDICATORS	INDICATOR (QUANTIFIED AND TIME-BOUND)	BASELINE	TARGET	SOURCE OF VERIFICATION	ASSUMPTIONS/RISKS
4.1.1.	evaluation	prepared Mid-term review (optional) and terminal evaluation conducted Number of project steering committee meetings Number of dissemination materials		months of project start Mid-term review (optional) Terminal evaluation completed by end of project closing time Project terminal report completed by end of project At least one (1) project steering committee meeting per year Dissemination materials ready by the end of project	Mid-term self-assessment Terminal evaluation Report (optional) Project terminal report Copies of dissemination material	the Project Manager exists for proper management and monitoring of the project. Project gets commissioned successfully and the expected outputs achieved sustainably.

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).

MO February 27, 2017

All comments cleared. The Program Manager recommends PIF approval. Before submitting CEO approval request for this MSP, please improve cost-efficiency and increase GEBs.

The detailed GHG emission reduction calculations are now available. In this context the cost-efficiency and the GEBs have increased significantly.

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS²²

A. Provide detailed funding amount of the PPG activities financing status in the table below:

PPG Grant Approved at PIF: USD 50,000			
<i>Project Preparation Activities Implemented</i>	<i>GETF/LDCF/SCCF/CBIT Amount (\$)</i>		
	<i>Budgeted Amount</i>	<i>Amount Spent To date</i>	<i>Amount Committed</i>
Market Assessment	15,000	15,000	0
Stakeholder Consultation	15,000	14,997	3
Detailed Project Design and methodology for calculating the GHG Emission Savings	20,000	20,000	0
Total	50,000	49,997	3

²² If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue to undertake the activities up to one year of project start. No later than one year from start of project implementation, Agencies should report this table to the GEF Secretariat on the completion of PPG activities and the amount spent for the activities. Agencies should also report closing of PPG to Trustee in its Quarterly Report.

ANNEX D: CALENDAR OF EXPECTED REFLOWS (if non-grant instrument is used)

Provide a calendar of expected reflows to the GEF/LDCF/SCCF/CBIT Trust Funds or to your Agency (and/or private sector fund that will be set up)

NA (No "non-grant instrument" is used)

ANNEX E: WORK-TIME DIAGRAM

Expected Outputs	Time-Frame																GEF Budget USD
	Y1				Y2				Y3				Y4				
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Component 1: POLICY AND REGULATORY FRAMEWORK																	200,000
<i>Outcome 1.1: Enhanced market opportunities for SEC businesses through a coherent policy, regulatory and incentive framework and improved public-private coordination</i>																	
Output 1.1.1 – A dialogue platform to promote sustainable energy and climate innovation, entrepreneurship and industrial development is fully operational																	
Output 1.1.2 – A vision statement and strategy to promote the country as a hub for SEC technologies and services is developed and promoted abroad through various means																	
Output 1.1.3 – 3 Annual high-level policy dialogues on sustainable energy and climate industry issues are organized																	
Output 1.1.4 – Demand creating and supplier oriented proposals to improve the coherence and effectiveness of policies and legislation are formulated and under implementation																	
Component 2: INVESTMENT AND BUSINESS PROMOTION																	1,100,000
<i>Outcome 2.1: Increased investments into the domestic sustainable energy servicing and manufacturing industry in technology areas with high GHG emission and value creation potential</i>																	
Output 2.1.1 – A sustainable energy and climate technology cluster hub is created and provides effective services to its expanding member base																	
Output 2.1.2 – A dedicated financing facility provides grants and concessional loans for the commercialisation of business ideas and innovations developed in the scope of the cluster																	
Output 2.1.3 – A business match-maker provides market intelligence and interlinks cluster members with technology companies, investors and venture capitalist in the Caribbean, the diaspora and internationally																	

Component 3: CAPACITY BUILDING AND KNOWLEDGE MANAGEMENT															264,985	
<i>Outcome 3.1: Enhanced innovation and implementation capacities of sustainable energy businesses in technology areas with high GHG emission reduction and value creation potential</i>																
Output 3.1.1 – Proposals for improved product, service and qualification standards and certifications are formulated (e.g. PV, solar-thermal buildings, appliances)																
Output 3.1.2 – One (1) on-line training program on sustainable energy island solutions is developed and applied by educational institutions and experts in Barbados																
Output 3.1.3 – At least 300 experts from various sectors are trained through national and sub-regional trainings, by train-the trainer approaches and training missions																
Output 3.1.4 – At least two R&D partnerships between companies of the cluster and domestic and/or international applied research institutions are created and under execution																
PROJECT COMPONENT 4 - MONITORING AND EVALUATION															50,000	
<i>Outcome 4.1. – Project’s progress towards objectives continuously monitored and evaluated</i>																
Output 4.1.1 – Project monitoring and evaluation																

ANNEX F: INDICATIVE GEF BUDGET

Expected Outputs	Time-Frame				GEF Budget USD
	Y1	Y2	Y3	Y4	
	USD	USD	USD	USD	
Component 1: POLICY AND REGULATORY FRAMEWORK					200,000
<i>Outcome 1.1: Enhanced market opportunities for SEC businesses through a coherent policy, regulatory and incentive framework and improved public-private coordination</i>					
Output 1.1.1 – A dialogue platform to promote sustainable energy and climate innovation, entrepreneurship and industrial development is fully operational	30,000	10,000	10,000	5,000	55,000
Output 1.1.2 – A vision statement and strategy to promote the country as a hub for SEC technologies and services is developed and promoted abroad through various means	10,000	10,000	10,000	5,000	35,000
Output 1.1.3 – Annual high-level policy dialogues on sustainable energy and climate industry issues are organized	20,000	20,000	20,000	5,000	65,000
Output 1.1.4 – Demand creating and supplier oriented proposals to improve the coherence and effectiveness of policies and legislation are formulated and under implementation	20,000	20,000	5,000		45,000
Component 2: INVESTMENT AND BUSINESS PROMOTION					1,100,000
<i>Outcome 2.1: Increased investments into the domestic sustainable energy servicing and manufacturing industry in technology areas with high GHG emission and value creation potential</i>					
Output 2.1.1 – A sustainable energy and climate technology cluster hub is created and provides effective services to its expanding member base	300,000	200,000	200,000	200,000	900,000
Output 2.1.2 – A dedicated financing facility provides grants and concessional loans for the commercialisation of business ideas and innovations developed in the scope of the cluster	10,000	30,000	30,000	30,000	100,000
Output 2.1.3 – A business match-maker provides market intelligence and interlinks cluster members with technology companies, investors and venture capitalist in the Caribbean, the diaspora and internationally	20,000	40,000	30,000	10,000	100,000
Component 3: CAPACITY BUILDING AND KNOWLEDGE MANAGEMENT					264,985
<i>Outcome 3.1: Enhanced innovation and implementation capacities of sustainable energy businesses in technology areas with high GHG emission reduction and value creation potential</i>					
Output 3.1.1 – Proposals for improved product, service and qualification standards and certifications are formulated (e.g. PV, solar-thermal buildings, appliances)	15,000	20,000	20,000	20,000	75,000
Output 3.1.2 – One (1) on-line training program on sustainable energy island solutions is developed and applied by educational institutions and experts in Barbados		8,000	8,000	8,000	24,000
Output 3.1.3 – At least 300 experts from various sectors are trained through national and sub-regional trainings, by train-the trainer approaches and training missions	30,985	30,000	30,000	30,000	120,985
Output 3.1.4 – At least two R&D partnerships between companies of the cluster and domestic and/or international applied research institutions are created and under execution		15,000	15,000	15,000	45,000
PROJECT COMPONENT 4 - MONITORING AND EVALUATION					50,000
<i>Outcome 4.1. – Project's progress towards objectives continuously monitored and evaluated</i>					
Output 4.1.1 – Project monitoring and evaluation	5000	5000	10000	30000	50,000
Total	460,985	408,000	388,000	358,000	1,614,985

The following budget sheet is tentative and exact amounts and modalities will be finalized in discussions with all execution partners in the inception phase of the project.

Component 1 - POLICY AND REGULATORY FRAMEWORK	Type of Expense	Year 1		Year 2		Year 3		Year 4		Output Total		Envisaged Execution Modality to be discussed in detail in the kick-off meeting
		w/w	\$	w/w	\$	w/w	\$	w/w	\$	w/w	\$	
<i>Output 1.1.1 – A dialogue platform to promote sustainable energy and climate innovation, entrepreneurship and industrial development is fully operational</i>	International Expertise	8	22,000	2	7,000	2	7,000	1	3,500	13	39,500	Part of an execution agreement with MIICs to be discussed in the kick-off meeting
	Local Travel		3,000		1,000		1,000		1,000	0	6,000	
	National Expertise	4	3,000	2	1,500	2	1,500			8	6,000	
	Training/Workshops									0	0	
	Equipment									0	0	
	Miscellaneous		2,000		500		500		500	0	3,500	
	Output sub-total	12	30,000	4	10,000	4	10,000	1	5,000	21	55,000	
<i>Output 1.1.2 – A vision statement and strategy to promote the country as a hub for SEC technologies and services is developed and promoted abroad through various means</i>	International Expertise	2	7,000	2	7,000	2	7,000	1	3,500	7	24,500	Part of an execution agreement with MIICs to be discussed in the kick-off meeting
	Local Travel		1,000		1,000		1,000		1,000	0	4,000	
	National Expertise	2	1,500	2	1,500	2	1,500			6	4,500	
	Training/Workshops									0	0	
	Equipment									0	0	
	Miscellaneous		500		500		500		500	0	2,000	
	Output sub-total	4	10,000	4	10,000	4	10,000	1	5,000	13	35,000	
<i>Output 1.1.3 – Annual high-level policy dialogues on sustainable energy and climate industry issues are organized</i>	International Expertise	4	14,000	4	14,000	4	14,000	1	3,500	13	45,500	Part of an execution agreement with MIICs to be discussed in the kick-off meeting
	Local Travel		3,000		3,000		3,000		1,000	0	10,000	
	National Expertise	4	3,000	4	3,000	4	3,000			12	9,000	
	Training/Workshops									0	0	
	Equipment									0	0	
	Miscellaneous								500	0	500	
	Output sub-total	8	20,000	8	20,000	8	20,000	1	5,000	25	65,000	
<i>Output 1.1.4 – Demand creating and supplier oriented proposals to improve the coherence and effectiveness of policies and legislation are formulated and under implementation</i>	International Expertise	4	14,000	4	14,000	1	3,500			9	31,500	Part of an execution agreement with MIICs to be discussed in the kick-off meeting
	Local Travel		3,000		3,000		1,000			0	7,000	
	National Expertise	4	3,000	4	3,000					8	6,000	
	Training/Workshops									0	0	
	Equipment									0	0	
	Miscellaneous						500			0	500	
	Output sub-total	8	20,000	8	20,000	1	5,000	0	0	17	45,000	
TOTAL Component 1		32	80,000	24	60,000	17	45,000	3	15,000	76	200,000	

		GEF Grant Budget Component 2										
Component 2 -INVESTMENT AND BUSINESS PROMOTION	Type of Expense	Yr 1		Yr 2		Yr 3		Yr 4		Output Total		Execution Modality
		w/w	\$	w/w	\$	w/w	\$	w/w	\$	w/w	\$	
<i>Output 2.1.1 – A sustainable energy and climate technology cluster hub is created and provides effective services to its expanding member base</i>	International Expertise	30	105,000	25	87,500	25	87,500	25	87,500	105	367,500	Part of an execution agreement with BIDD to be discussed in the kick-off meeting
	Local Travel		11,000		3,000		3,000		3,000	0	20,000	
	National Expertise	120	72,000	95	57,000	95	57,000	95	57,000	429	243,000	
	Training/Workshops		60,000		5,000		5,000		5,000	0	75,000	
	Equipment		40,000		46,000		46,000		46,000	0	178,000	
	Miscellaneous		12,000		1,500		1,500		1,500	0	16,500	
	Output sub-total	150	300,000	120	200,000	120	200,000	120	200,000	534	900,000	
<i>Output 2.1.2 – A dedicated financing facility provides grants and concessional loans for the commercialisation of business ideas and innovations developed in the scope of the cluster</i>	International Expertise	2	7,000	4	14,000	4	14,000	4	14,000	14	49,000	Part of an execution agreement with BIDD to be discussed in the kick-off meeting
	Local Travel		1,000							0	1,000	
	National Expertise	2	1,500	8	6,000	8	6,000	8	6,000	26	19,500	
	Training/Workshops				10,000		10,000		10,000	0	30,000	
	Equipment									0	0	
	Miscellaneous		500							0	500	
	Output sub-total	4	10,000	12	30,000	12	30,000	12	30,000	40	100,000	
<i>Output 2.1.3 – A business match-maker provides market intelligence and interlinks cluster members with technology companies, investors and venture capitalist in the Caribbean, the diaspora and internationally</i>	International Expertise	4	14,000	4	15,000	4	14,000	2	7,000	14	50,000	Part of an execution agreement with CCREEE to be discussed in the kick-off meeting
	Local Travel				5,000					0	5,000	
	National Expertise	8	6,000	8	4,000	8	6,000	4	3,000	28	19,000	
	Training/Workshops				6,000		10,000			0	16,000	
	Equipment									0	0	
	Miscellaneous				10,000					0	10,000	
	Output sub-total	12	20,000	12	40,000	12	30,000	6	10,000	42	100,000	
TOTAL Component 2	166	330,000	144	270,000	144	260,000	138	240,000	616	1,100,000		

GEF Grant Budget Component 3												
Component 3 - CAPACITY BUILDING AND KNOWLEDGE MANAGEMENT	Type of Expense	Yr 1		Yr 2		Yr 3		Yr 4		Output Total		Execution Modality
		w/w	\$	w/w	\$	w/w	\$	w/w	\$	w/w	\$	
<i>Output 3.1.1 – Proposals for improved product, service and qualification standards and certifications are formulated (e.g. PV, solar-thermal buildings, appliances)</i>	International Expertise	3	12,500	4	14,000	4	14,000	4	14,000	15	54,500	Part of an execution agreement with BREa to be discussed in the kick-off meeting
	Local Travel									0	0	
	National Expertise	5	2,500	8	6,000	8	6,000	8	6,000	29	20,500	
	Training/Workshops									0	0	
	Output sub-total	8	15,000	12	20,000	12	20,000	12	20,000	44	75,000	
<i>Output 3.1.2 – One (1) on-line training program on sustainable energy island solutions is developed and applied by educational</i>		w/w	\$	w/w	\$	w/w	\$	w/w	\$	w/w	\$	
	International Expertise			2	7,000	2	7,000	2	7,000	6	21,000	Part of an execution agreement with CCREEE to be discussed in the kick-off meeting
	Local Travel				1,000		1,000		1,000	0	3,000	
	National Expertise									0	0	
	Output sub-total	0	0	8,000	8,000	8,000	8,000	6	24,000			
	w/w	\$	w/w	\$	w/w	\$	w/w	\$	w/w	\$		
<i>Output 3.1.3 – At least 300 experts from various sectors are trained through national and sub-regional trainings, by train-the trainer approaches and training missions</i>	International Expertise	4	14,000	4	14,000	4	14,000	4	14,000	28	56,000	Part of an execution agreements with BIDC, BREa and CCREEE to be discussed in the kick-off meeting
	Local Travel		3,000							0	3,000	
	National Expertise	12	7,200	8	6,000	8	6,000	8	6,000	72	25,200	
	Training/Workshops		6,785		10,000		10,000		10,000	0	36,785	
	Equipment									0	0	
	Miscellaneous									0	0	
	Output sub-total	4	30,985	30,000	30,000	30,000	30,000	100	120,985			
<i>Output 3.1.4 – At least two R&D partnerships between companies of the cluster and domestic and/or international applied research institutions are created and under execution</i>		w/w	\$	w/w	\$	w/w	\$	w/w	\$	w/w	\$	
	International Expertise			2	7,000	2	7,000	2	7,000	18	21,000	Part of an execution agreement with CCREEE to be discussed in the kick-off meeting
	Local Travel									0	0	
	National Expertise			4	3,000	4	3,000	4	3,000	48	9,000	
	Training/Workshops				5,000		5,000		5,000	0	15,000	
	Equipment									0	0	
	Miscellaneous									0	0	
Output sub-total	0	0	15,000	15,000	15,000	15,000	66	45,000				
TOTAL Component 3	8	45,985	12	73,000	12	73,000	12	73,000	216	264,985		

Component 4: M&E		w/w	\$	w/w	\$	w/w	\$	w/w	\$	w/w	\$	
	International Expertise					1	7,500	4	15,000	10	22,500	UNIDO as Implementing Agency
	Local Travel								5,000	0	5,000	UNIDO as Implementing Agency
	National Expertise	10	5,000	10	5,000	5	2,500	8	4,000	41	16,500	UNIDO as Implementing Agency
	Training/Workshops								6,000	0	6,000	UNIDO as Implementing Agency
	Equipment									0	0	UNIDO as Implementing Agency
	Miscellaneous									0	0	UNIDO as Implementing Agency
	TOTAL Component 4	10	5,000	10	5,000	6	10,000	12	30,000	51	50,000	
Project Management Costs (PMC)		w/w	\$	w/w	\$	w/w	\$	w/w	\$	w/w	\$	
	Local Travel		5,000		5,000		5,000		5,000		20,000	Part of the execution agreements with MIICs and BIDC to be discussed in the kick-off meeting
	National Expertise	78	39,000	78	14,400	78	39,000	78	39,000	364	131,400	
	Training/Workshops									0	0	
	Equipment									0	0	
	Miscellaneous		3,000		3,000		3,000		1,099	0	10,099	
	TOTAL PMC	78	47,000	78	22,400	78	47,000	78	45,099	364	161,499	
TOTAL											1,776,484	

ANNEX G: BARBADOS SUSTAINABLE ENERGY INDUSTRY MARKET ASSESSMENT

see separate document

ANNEX H: PRE-FEASIBILITY STUDY ON THE SUSTAINABLE ENERGY AND CLIMATE CLUSTER

see separate document

ANNEX I: GHG EMISSION REDUCTION REPORT

see separate document

ANNEX J: GHG TRACKING TOOL

see separate document

ANNEX K: CO-FINANCING LETTERS

see separate document