



**GREEN
CLIMATE
FUND**

Meeting of the Board
13 - 15 December 2016
Apia, Samoa
Provisional agenda item 16(e)

GCF/B.15/13/Add.06

24 November 2016

Consideration of funding proposals – Addendum VI

Funding proposal package for FP033

Summary

This addendum contains the following three parts:

- a) A funding proposal titled “Accelerating the Transformational Shift to a Low-Carbon Economy in the Republic of Mauritius” submitted by UNDP;
- b) A no-objection letter issued by the national designated authority or focal point; and
- c) Environmental and social report(s) disclosure.

The documents are presented as submitted by the accredited entity, and national designated authority or focal point, respectively.

Table of Contents

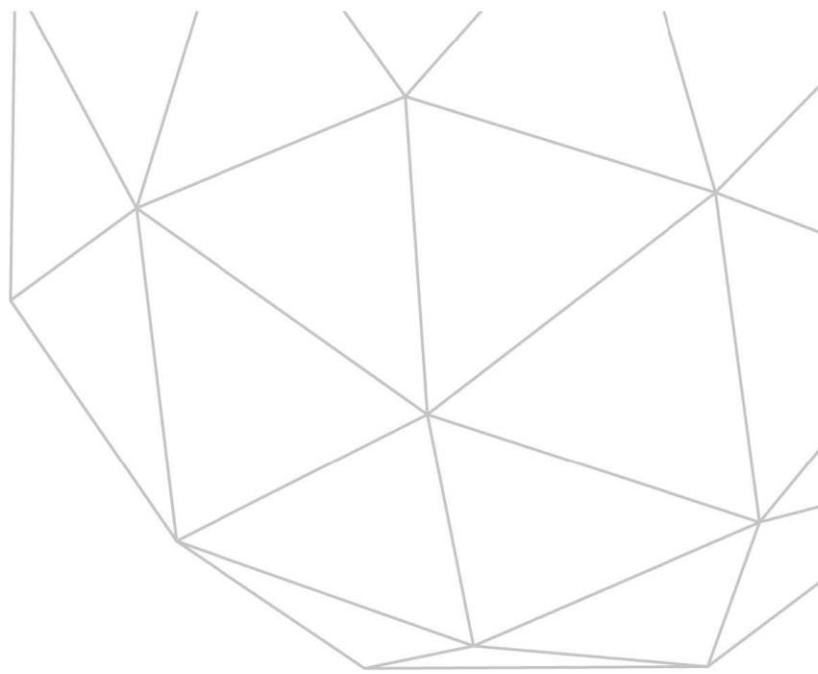
Funding proposal submitted by the accredited entity

No-objection letter issued by the national designated authority or focal point

Environmental and social report(s) disclosure



GREEN
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Funding Proposal

Version 1.0

The Green Climate Fund (GCF) is seeking high-quality funding proposals.

Accredited entities are expected to develop their funding proposals, in close consultation with the relevant national designated authority, with due consideration of the GCF's Investment Framework and Results Management Framework. The funding proposals should demonstrate how the proposed projects or programmes will perform against the investment criteria and achieve part or all of the strategic impact results.

Contents

Section A	PROJECT / PROGRAMME SUMMARY
Section B	FINANCING / COST INFORMATION
Section C	DETAILED PROJECT / PROGRAMME DESCRIPTION
Section D	RATIONALE FOR GCF INVOLVEMENT
Section E	EXPECTED PERFORMANCE AGAINST INVESTMENT CRITERIA
Section F	APPRAISAL SUMMARY
Section G	RISK ASSESSMENT AND MANAGEMENT
Section H	RESULTS MONITORING AND REPORTING
Section I	ANNEXES

Note to accredited entities on the use of the funding proposal template

- Sections **A, B, D, E** and **H** of the funding proposal require detailed inputs from the accredited entity. For all other sections, including the Appraisal Summary in section F, accredited entities have discretion in how they wish to present the information. Accredited entities can either directly incorporate information into this proposal, or provide summary information in the proposal with cross-reference to other project documents such as project appraisal document.
- The total number of pages for the funding proposal (excluding annexes) is expected not to exceed 50.

Please submit the completed form to:

fundingproposal@gcfund.org

Please use the following name convention for the file name:

“[FP]-[Agency Short Name]-[Date]-[Serial Number]”

FP-UNDP-201016-5681

A.1. Brief Project / Programme Information		
A.1.1. Project / programme title	Accelerating the transformational shift to a low-carbon economy in the Republic of Mauritius	
A.1.2. Project or programme	Project	
A.1.3. Country (ies) / region	Republic of Mauritius	
A.1.4. National designated authority (ies)	Ministry of Finance and Economic Development	
A.1.5. Accredited entity	United Nations Development Programme	
A.1.5.a. Access modality	<input type="checkbox"/> Direct <input checked="" type="checkbox"/> International	
A.1.6. Executing entity / beneficiary	<p>Executing Entity: Ministry of Finance and Economic Development</p> <p>Responsible Parties (entities with delegated execution responsibilities):</p> <ul style="list-style-type: none"> • Component 1: Ministry of Energy and Public Utilities • Component 2: Central Electricity Board • Component 3: Outer Islands Development Corporation <p>Beneficiary:</p> <ul style="list-style-type: none"> • 129,500 households (one-third of Mauritian households) with improved access to low-emission sources of electricity 	
A.1.7. Project size category (Total investment, million USD)	<input type="checkbox"/> Micro (≤ 10) <input type="checkbox"/> Small ($10 < x \leq 50$) <input checked="" type="checkbox"/> Medium ($50 < x \leq 250$) <input type="checkbox"/> Large (> 250)	
A.1.8. Mitigation / adaptation focus	<input checked="" type="checkbox"/> Mitigation <input type="checkbox"/> Adaptation <input type="checkbox"/> Cross-cutting	
A.1.9. Date of submission	30 July 2015 11 September 2015 12 October 2015 19 November 2015 8 December 2015 28 December 2015 10 August 2016 5 September 2016 20 October 2016	
A.1.10. Project contact details	Contact person, position	Mr Robert Kelly Regional Technical Advisor, Africa
	Organization	United Nations Development Programme
	Email address	robert.kelly@undp.org
	Telephone number	+251 91250 3306
	Mailing address	UNDP – Global Environment Finance, UNDP Regional Service Centre, Main Bole Road, Olympia, P.O. Box 60130, Addis Ababa, Ethiopia.

A.1.11. Results areas *(mark all that apply)*

Reduced emissions from:

- Energy access and power generation
(E.g. on-grid, micro-grid or off-grid solar, wind, geothermal, etc.)
- Low emission transport
(E.g. high speed rail, rapid bus system, etc.)
- Buildings, cities and industries and appliances
(E.g. new and retrofitted energy-efficient buildings, energy-efficient equipment for companies and supply chain management, etc.)
- Forestry and land use
(E.g. forest conservation and management, agroforestry, agricultural irrigation, water treatment and management, etc.)

Increased resilience of:

- Most vulnerable people and communities
(E.g. mitigation of operational risk associated with climate change – diversification of supply sources and supply chain management, relocation of manufacturing facilities and warehouses, etc.)
- Health and well-being, and food and water security
(E.g. climate-resilient crops, efficient irrigation systems, etc.)
- Infrastructure and built environment
(E.g. sea walls, resilient road networks, etc.)
- Ecosystem and ecosystem services
(E.g. ecosystem conservation and management, ecotourism, etc.)

A.2. Project / Programme Executive Summary (max 300 words)

1. With 84% of its primary energy requirements met from imported fossil fuels, Mauritius, like many Small Island Developing States (SIDS), is extremely vulnerable to energy shocks. The grid emission factor of Mauritius is extremely high at 1.01 tonnes CO₂/MWh due to the prevalence of imported coal (39%) and fuel oil (38%) in the electricity generation mix. Net greenhouse gas emissions are increasing at a rapid rate of 3% per year. The pressing need to significantly enhance Mauritius's energy independence and reduce greenhouse gas emissions is recognised in the country's Nationally Determined Contribution (2016), its Second National Communication to the UNFCCC (2010) and its UNFCCC Technology Needs Assessment (2014), as well as in a comprehensive suite of Government strategies and policies contained in the Long-Term Energy Strategy (2011-2025).
2. Following a broad consultative process led by the NDA and backed by sound technical and financial analysis as well as considerable political will, this project will remove the principal bottlenecks to investment in low-carbon development for: (i) grid-connected intermittent renewable energy; and (ii) mini-grid PV for the principal outer island, Agalega. The project will be implemented in a two-phase approach so as to reduce the implementation risks to the GCF and ensure that the second funding disbursement is contingent upon successful completion of the first phase.
3. The project seeks a total of US\$ 28.21 million of GCF grant resources, split across phase 1 (US\$ 12 million) and phase 2 (US\$ 16.21 million), to overcome identified barriers to low-carbon investment. The incremental logic of the project and its requirement for grant resources are clearly laid out in the proposal. Overall, the project will result in a reduction in greenhouse gas emissions of 4.27 million tCO_{2e} over the lifetimes of the investments enabled, at a cost to the GCF of just US\$ 6.6/tCO_{2e}.

A.3. Project/Programme Milestone	
Expected approval from accredited entity's Board (if applicable)	Date: 31/01/2016 ¹
Expected financial close (if applicable)	N/A
Estimated implementation start and end date	Start: <u>01/03/2017</u> End: <u>31/12/2024</u>
Project/programme lifespan	20 years ²

¹ A Preliminary Project Appraisal Committee (PAC) meeting was held in Port Louis on 16 July 2015: this involved 18 institutions spanning Government, the private sector, NGOs, academia and regional organisations (see Annex VIIa). A formal PAC meeting to assess the UNDP Project Document, constituting formal UNDP approval of the GCF project, will be held by 31 January 2017 assuming GCF Board approval of the proposal is provided at the December 2016 Board meeting.

² The lifespan of the project, understood to be the period over which direct benefits take place, matches the estimated lifetime of the longest-lived equipment installed through the project: 20 years for the PV equipment installed under Components 2 and 3. UNDP is open to supporting post-project implementation and/or monitoring of results during the project lifespan, provided there is more guidance from the GCF Board on what is expected, including details on how many years after project closure this support is to be carried out, and what form it will take. In the context of potential post-implementation project support, UNDP can develop a post-project implementation plan and budget in the seventh year of the project for discussion and approval by the GCF.

B.1. Description of Financial Elements of the Project / Programme

4. The project consists of 3 inter-related components:
 - Component 1: Institutional strengthening for renewable energy
 - Component 2: Improving Grid Absorption Capacity followed by PV deployment
 - Component 3: PV mini-grids on the Outer Island of Agalega
5. The project will be implemented in two phases so that funds can be disbursed in a logical and appropriate manner without burdening the GCF or the executing entities. Phase 1 will be implemented between 2017-2019; Phase 2 will be implemented between 2020-2024.
6. Under Phase 1 (2017-2019), the following components will be executed:
 - Component 1: Institutional strengthening for renewable energy (GCF finance: US\$ 1.1 million; co-finance: US\$ 1.08 million)
 - Component 2, Phase 1: Improving Grid Absorption Capacity and PV deployment (GCF finance: US\$ 10.9 million; co-finance: US\$ 20 million)
7. Under Phase 2 (2020-2024), the following components will be executed:
 - Component 2, Phase 2: Improving Grid Absorption Capacity and PV deployment (GCF finance: US\$ 15.4 million; co-finance: US\$ 140.9 million)
 - Component 3: PV mini-grids on the Outer Island of Agalega (GCF finance: US\$ 0.81 million; co-finance: US\$ 1.2 million)
8. A detailed description of the project design and phasing is provided in Section C.3.
9. The total GCF grant resources sought for the overall project are US\$ 28.21 million: US\$ 12 million for Phase 1 and \$ 16.21 million for Phase 2. The project will leverage considerable co-finance – US\$ 163.18 million – from the public and private sectors. The breakdown of GCF and co-finance resources across the phases is presented in Table 1 below:

Table 1. Breakdown of GCF Finance and Co-Finance Across the Phases

Phase	Duration	GCF Grant Finance	Co-Finance
Phase 1	3 years	US\$ 12 million	US\$ 21.08 million
Phase 2	5 years	US\$ 16.21 million	US\$ 142.1 million

10. This proposal seeks Board approval for the full funding envelope (US\$ 28.21 million) but on the understanding that funding for Phase 2 is subject to successful completion of Phase 1: GCF resources for Phase 2 of the project will only be released upon successful completion of key final-year milestones of Phase 1. The criteria for assessing “successful completion” of Phase 1 will be as follows:
 - Successful completion of the first Mid-Term Review of the GCF project early in Year 3 (which will act as a de facto terminal evaluation of Phase 1) with a Satisfactory rating or better; and
 - The improvement in the Grid Absorption Capacity process outlined in Section C.3 must have been at least 80% completed. In addition, all currently signed renewable energy Power Purchase Agreements (PPAs), amounting to an additional 40 MW installed capacity, must have been completed and connected to the grid.
11. The breakdown of GCF finance and co-finance across the components and sub-components is presented in Table 2 below. Note that this breakdown is inclusive of project management costs but excludes agency fees.

Table 2: Breakdown of GCF Finance and Co-Finance Across the Components and Sub-Components³

Component	Sub-component (if applicable)	GCF Financing (US\$ millions)	Co-Financing	
			Source	Amount (US\$ millions)
1. Institutional strengthening for renewable energy	1.1 Institutional strengthening of MARENA	1.1	Government of Mauritius (MEPU)	1.0
			UNDP	0.08
2. Improving Grid Absorption Capacity followed by PV deployment	2.1 Installation of Battery Energy Storage System and accompanying software for grid to absorb up to 185 MW of intermittent RE	10.9	UNDP	1
			CEB	2
			AFD	17
	2.2 Smart grid	2.7	CEB	1
			AFD	1.7
	2.3 PV deployment	12.7	CEB	119
AFD			19.2	
3. PV mini-grids on the outer island of Agalega	3.1 PV mini-grids on the Outer Island of Agalega	0.81	Government of Mauritius (OIDC)	0.9
			UNDP	0.3
Total		28.21		163.18

12. The breakdown of GCF finance across the components and sub-components in local currency is presented in Table 3 below.

Table 3: Breakdown of GCF Cost Estimates in US\$ and in Local Currency

Component	Sub-component (if applicable)	Amount (US\$)	Amount (Mauritius Rupee) ⁴
1. Institutional strengthening for renewable energy	1.1 Institutional strengthening of MARENA	1.1	38,753,000
2. Improving Grid Absorption Capacity and PV deployment	2.1 Installation of Battery Energy Storage System and accompanying software for grid to absorb up to 185 MW of intermittent RE	10.9	384,007,000
	2.2 Smart grid	2.7	95,121,000
	2.3 PV deployment	12.7	447,421,000
3. PV mini-grids on the Outer Island of Agalega	3.1 PV mini-grids on the Outer Island of Agalega	0.81	28,536,300

³ The budget total includes project management costs but excludes the fee of the GCF Accredited Entity (see Section B.3).

⁴ The exchange rate used throughout the proposal is US\$ 1 = MUR 35.23.

Total	28.21	993,838,300
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13. UNDP's currency hedging mechanism is based on matching cash flows (i.e. revenues and expenses) in non-US\$ currencies and bank account balances are targeted not to exceed approximately one month's disbursement requirements to minimise risk.

Detailed financial analysis of the project is given in Annex III and in Section F.1.

B.2. Project Financing Information

	Financial Instrument	Amount	Currency	Tenor	Pricing		
(a) Total project financing	(a) = (b) + (c)	191.39	<u>million USD</u> (\$)				
(b) Requested GCF amount	(i) Senior Loans	.....	<u>Options</u>	() years	() %	
	(ii) Subordinated Loans	.....	<u>Options</u>	() years	() %	
	(iii) Equity	.....	<u>Options</u>		() % IRR	
	(iv) Guarantees	.....	<u>Options</u>			
	(v) Reimbursable grants *	.....	<u>Options</u>			
	(vi) Grants *	28.21	<u>million USD</u> (\$)				
* Please provide economic and financial justification in section F.1 for the concessionality that GCF is expected to provide, particularly in the case of grants. Please specify difference in tenor and price between GCF financing and that of accredited entities. Please note that the level of concessionality should correspond to the level of the project/programme's expected performance against the investment criteria indicated in section E .							
	Total requested (i+ii+iii+iv+v+vi)	28.21	<u>million USD</u> (\$)				
(c) Co-financing	Financial Instrument	Amount	Currency	Name of Institution	Tenor	Pricing	Seniority
	<u>Senior Loans</u>	37.9	<u>Million USD</u> (\$)	AFD	20 years	2.86% in Euros or 6% in Mauritian rupees including cost of hedging against foreign currency risk. The terms between CEB and AFD are currently being finalised.	<u>Senior</u>

	<u>Grant</u>	123.9	<u>Million USD</u> <u>(\$)</u>	Government of Mauritius (including CEB)			
	<u>Grant</u>	1.38 ⁵	<u>Million USD</u> <u>(\$)</u>	UNDP			
	Lead financing institutions: Government of Mauritius, Central Electricity Board of Mauritius, Agence Française de Développement (AFD) ⁶ .						
	* Please provide a confirmation letter or a letter of commitment in section I issued by the co-financing institution. Co-finance letters are attached to this proposal in Annex IV. AFD co-finance is subject to successful completion of AFD due diligence on its loan.						
B.3. Fee Arrangement							
14. The fee arrangement for the proposed project is to be aligned with the GCF Board's decision on fees.							
15. The budget figures presented in this proposal exclude the fee: i.e. the resources required to cover quality assurance and oversight services performed by UNDP over all phases of the project cycle as follows: (i) oversight of proposal development; (ii) appraisal (pre and final) and oversight of project start-up; (iii) supervision and oversight of project implementation; and (iv) oversee project closure.							
B.4. Financial Market Overview (if applicable)							
16. Not applicable.							

⁵ Cash co-finance.

⁶ AFD and UNDP work closely together in Mauritius so as to deliver technical assistance in the most effective manner, and the GCF project represents an example of the two agencies' coordinated approach. UNDP will provide technical assistance and project management support services to the GCF project, while AFD will provide concessional loans as co-finance for targeted elements of the project. Both agencies will leverage and build on extensive experience and baseline projects in Mauritius. The cooperation between AFD and UNDP, for the GCF project specifically and for development initiatives more generally, is governed by a Memorandum of Understanding (Annex XIIIh). AFD's role in the context of the GCF project is as a co-financier; UNDP is the sole Accredited Entity seeking funds from the GCF.

Please fill out applicable sub-sections and provide additional information if necessary, as these requirements may vary depending on the nature of the project / programme.

C.1. Strategic Context

17. The Republic of Mauritius is an island nation off the south-east coast of the African continent in the south-west Indian Ocean, approximately 900 km east of Madagascar. In addition to the island of Mauritius, the Republic includes the islands of Cargados Carajos, Rodrigues and the Agalega Islands, totalling a population of 1.3 million inhabitants. A clear demonstration of the pertinence of this project is that the Mauritius Nationally Determined Contribution (NDC) Action Plan, approved by the Cabinet of Ministers in March 2016, clearly references the GCF project⁷.
18. Mauritius is heavily reliant on fossil fuels to power its economy. The grid emission factor of Mauritius is an extremely high 1.01 tCO₂/MWh⁸ due to the prevalence of imported coal (39%) and fuel oil (38%) in the electricity generation mix.⁹ Even relatively modest measures to reduce fossil fuel use therefore have the potential to significantly enhance Mauritius's energy independence and reduce greenhouse gas emissions. This fact is recognised by the Government, which has embarked on a national strategy to reduce the country's dependence on fossil fuels – not only for energy security and climate change mitigation purposes but also to improve the country's deteriorating balance of payments.¹⁰ In this context, the Government has recently cancelled the planned construction of a 110 MW coal-fired power plant.¹¹
19. The Second National Communication to the UNFCCC (2010)¹² notes that Mauritius's overall greenhouse gas (GHG) emissions are growing by 3% per year, and those from the energy sector specifically by 5.4% per year. The energy sector accounts for 62% of Mauritius's total greenhouse gas emissions of 3.8 MtCO₂e. As identified by the country's UNFCCC Technology Needs Assessment (2014)¹³, solar energy and energy efficiency offer significant potential, particularly as the country's major current source of renewable energy – bagasse, which accounts for 16% of Mauritian electricity generation and 80% of renewable electricity generation – is intrinsically unscalable (due to land constraints and its seasonal availability).
20. The Government's drive to reduce fossil fuel use is reflected in the Long-Term Energy Strategy 2009-2025¹⁴. Under this Strategy, the Government has recently announced two key targets¹⁵:
- A renewable energy (RE) target of at least 35% of electricity production by 2025.¹⁶
 - The establishment of a dedicated Mauritius Renewable Energy Agency (MARENA) to coordinate the rapid uptake of renewable energy.
21. To facilitate the achievement of these targets, the support of local, regional and international institutions is being actively sought.¹⁷
22. The Government Action Plan (2015-2019)¹⁸ provides the framework in which national strategies, including the Outline Energy Policy¹⁹, the Long-Term Energy Strategy 2009-2025²⁰ and CEB's Integrated Electricity Plan²¹, will be realised. A number of actions are under implementation under the Action Plan:

⁷ Mauritius INDC Action Plan 2016:

<http://pmo.govmu.org/English/Documents/Cabinet%20Decisions%202016/Cabinet%20Decisions%204%20March%202016.pdf>

⁸ https://cdm.unfccc.int/methodologies/standard_base/Grid_emission_Mauritius.pdf

⁹ http://statsmauritius.govmu.org/English/Publications/Documents/EI1248/Energy_Water_Stats_Yr2015.pdf

¹⁰ In 2014, fuel and related products accounted for 19% of total imports: <http://statsmauritius.govmu.org/English/StatsbySubj/Pages/Export-and-Import-1st-Quarter-2015.aspx>

¹¹ <http://mauritiusassembly.govmu.org/English/hansard/Documents/2015/hansard0615.pdf>

¹² <http://unfccc.int/resource/docs/natc/muscnc2.pdf>

¹³ http://unfccc.int/tclear/templates/render cms_page?TNR_cre

¹⁴ <https://sustainabledevelopment.un.org/content/documents/1245mauritiusEnergy%20Strategy.pdf>

¹⁵ <http://www.investmauritius.com/budget2015/SREnergy.aspx>

¹⁶ As indicated in Annex XIIIg, the breakdown of this target is as follows: hydro: 2.2%; bagasse: 14.5%; small-scale and medium-scale solar PV: 0.6%; wind: 4.5%; solar: 4.6%; waste-to-energy: 8.7%.

¹⁷ <http://leboncoin.nu/2015/05/a-mauritius-renewable-energy-agency-to-be-set-up/>

¹⁸ <http://pmo.govmu.org/English/Documents/Reports%202015/Govt%20prog%202015.pdf>

¹⁹ See Annex XIIIi.

²⁰ See Annex XIIIj.

²¹ See Annex XIIy.

- In 2010, the Government of Mauritius launched, with UNDP support, the Small-Scale Distributed Generation (SSDG) scheme²², which has assisted 237 households, schools and public institutions to install small-scale (<50 kW) photovoltaic (PV) panels and wind turbines through the provision of a targeted feed-in tariff scheme. Such was the success of the scheme that its 2 MW capacity cap (in SSDG Phase 1) was reached in less than one year of the scheme starting, and subsequent extension of the scheme (SSDG Phase 2) led to an additional 0.94 MW being added within 12 months. Currently, a net-metering scheme (SSDG Phase 3) is ongoing with no special feed-in tariff and is proceeding slowly given the lack of support. The Government has, in its 2015-2016 Budget²³, stated its desire to scale-up the scheme (SSDG Phase 4) to encompass additional households and larger institutions. However, there is a need to significantly strengthen the absorption capacity of the national grid before additional intermittent renewable energy can be connected.
- With regard to the outer islands of the Republic of Mauritius, the Outer Islands Development Corporation (OIDC) has long been advocating the use of PV for Agalega²⁴, as this would have less of an environmental impact than the numerous oil drums that currently litter the island. Agalega, the largest outer island, is the furthest dependency of Mauritius and has not hitherto received the required attention in terms of infrastructural development. In addition, the berthing facilities at Agalega are limited and the transport of oil drums is undertaken by barges, a process that is fraught with risks of oil spillage in the pristine lagoon and capsizing of barges in unfavourable sea conditions. There is no central electricity grid on the two islands that make up Agalega; rather, the three villages in Agalega – containing a total of 300 inhabitants – are each served by diesel-powered mini-grids. Solar PV – as a decentralised, modular technology – represents a particularly attractive solution to reducing Agalega’s dependence on diesel. A number of PV systems were installed by the Ministry of Energy and Public Utilities in 2000 to service the local population: for example, a PV mini-grid in Vingt Cinq, the largest village, supplied communication equipment, administrative buildings and a small dispensary, together with 30 solar-powered street lights (the first street lighting on the island), initially with great success and to popular acclaim (see the technical assessment report in Annex II(d)). However, underlying barriers to sustainable use of the PV technology, notably lack of training for island-based technicians and the lack of a systematic sourcing mechanism for spare parts, led to regular breakdowns and ultimately mothballing of the systems in 2009. Building local technical capacity, as well as reinstating and enhancing the current PV systems, remains a key priority for OIDC.

23. The GCF project will enable Mauritius to fully meet its stated target of 35% renewable electricity production by 2025²⁵ and will give credence to the Government’s stated objective in the NDC of sustaining such a level in the period 2025 to 2030.

C.2. Project / Programme Objective against Baseline

*Climate Vulnerability Baseline*²⁶

24. The impacts of climate variability and extreme weather events are becoming a concern to the Republic of Mauritius, including the Outer Islands of Rodrigues, St Brandon and Agalega. The climate of Mauritius is influenced by large ocean-atmosphere interactions, and the islands are vulnerable to tropical cyclones and extreme weather. The islands of Saint Brandon, Agalega and the Cargados Carajos Shoals are also threatened by sea-level rise.
25. Analyses of temperatures recorded at Mauritius and its Outer Islands show a definite warming trend. Average temperature is rising at the rate of 0.15 °C per decade and has risen by 0.74-1.2 °C when compared with the 1961-1990 long-term mean.²⁷ At some urban stations the temperature has risen even higher. The temperature of Agalega is rising by 0.62 °C per decade.
26. The Second National Communication to the UNFCCC (2010) states that the electricity sector in Mauritius faces major challenges as a result of a changing climate. In particular, it highlights that air conditioning (AC) is now the main driver of growing peak summer demand for electricity and that warmer temperatures will provoke a spiral effect. Air

²² http://ceb.intnet.mu/grid_code/project.asp. See also Annex IIb.

²³ <http://mof.govmu.org/English/Pages/Budget20152016.aspx>

²⁴ <http://pmo.govmu.org/English/Documents/Reports%202015/Govt%20prog%202015.pdf>, paragraph 288.

²⁵ The 25 MW of small- and medium-scale PV that will be installed through Component 2 of the project will directly provide an incremental 2% of renewable energy, thereby directly contributing to the overall 35% target. Through the Improvement in Grid Absorption Capacity support provided by the GCF project, CEB will be able to accept the full 35% of intermittent renewables – as analysed in detail in the Mercados grid absorption study (Annex IIa).

²⁶ <http://metservice.intnet.mu/climate-services/climate-change.php>

²⁷ Mauritius Meteorological Services (2010) *Annual Report*, <http://www.metservice.intnet.mu/climate-services/climate-change.php>

conditioning currently accounts for 20% of electricity consumption in Mauritius in summer time, and is growing by 5% per year.

Baseline for Component 1: Institutional Strengthening for Renewable Energy

27. The Ministry of Energy and Public Utilities (MEPU)²⁸ is responsible for all policies relating to investment in the renewable energy sector. The Central Electricity Board (CEB)²⁹ is a parastatal entity under the purview of MEPU. CEB is responsible for the generation (in collaboration with Independent Power Producers, IPPs), transmission and distribution of electricity.
28. The current legal and institutional framework governing the energy sector is characterised by regulatory deficiencies, notably the fact that CEB, the dominant power supplier (accounting for 43% of electricity generation) and sole grid operator, also acts as the sector regulator. Parliament voted to establish an independent regulator seven years ago but the law has never been enacted. In the framework of the Long-Term Energy Strategy 2009-2025 and amidst growing concerns at the projected increases in power that will be necessary in the near-future (implying considerably more fossil fuel imports)³⁰, the Government has recently reaffirmed its intention to establish the Mauritius Renewable Energy Agency (MARENA).³¹ MARENA will initially perform a coordination and investment promotion function with regard to renewables and, in particular, renewable energy Independent Power Producers (IPPs).
29. Government capacity to establish and operationalise MARENA is limited as MEPU has only a small team of engineers (5 professional staff) responsible for overseeing the energy, water and wastewater sectors. Under a recently-closed UNDP-implemented, GEF-financed project, 'Removal of Barriers to Energy Efficiency and Energy Conservation in Buildings'³², assistance was provided to MEPU to establish the Energy Efficiency Management Office (EEMO).³³ EEMO is a highly strategic organisation at the centre of Government EE policy-making. Key achievements of EEMO in the space of its short life (since 2013) have included the development of national guidelines for energy efficiency, voluntary agreements with the private sector and national energy efficiency awareness campaigns. As with any new organisation, there was a need to recruit and train staff, and provide them with the necessary equipment to deliver on EEMO's mandate. While the process of recruiting staff and putting in place the necessary administrative procedures were carried out by Government, the UNDP-GEF project assisted in providing training, equipment and software. The marked success of this approach has led MEPU to request similar GCF support for the operationalisation of MARENA. In parallel with UNDP's support to EEMO, Agence Française de Développement (AFD) has been assisting a joint MEPU-private sector taskforce to develop a National Plan of Action on Energy Efficiency.³⁴

Baseline for Component 2: Improving Grid Absorption Capacity and PV Deployment

30. The current national grid is not ready to accommodate additional intermittent RE as it has been designed and operated for stable power generation (fossil fuels, bagasse and a limited amount of hydro-power). A grid absorption capacity study³⁵ developed by CEB in 2014 with UNDP and World Bank support indicates that grid stability is already a critical concern in the context of the current pipeline of renewable energy projects. The report finds that grid stability concerns can most cost-effectively be addressed through centralised solutions – notably the improvement of existing generation control systems, the implementation of Automatic Generation Control (AGC) infrastructure and the installation of lithium-ion batteries by CEB – combined with grid-edge solutions (an Advanced Distribution Management System (ADMS) with Advanced Metering Infrastructure (AMI)). With the introduction of these measures, at a total cost of US\$ 35.3 million, the upper limit for grid-connected intermittent renewables can be increased from the current constraining level of 60 MW to a considerably more accommodating 185 MW.
31. From a national policy perspective, the Mauritian Nationally Determined Contribution is the most recent and relevant international policy statement by the Mauritian Government, and it explicitly targets the expansion of renewable energy with the support of international donors:

²⁸ <http://publicutilities.govmu.org/English/Pages/default.aspx>

²⁹ <http://ceb.intnet.mu/>

³⁰ <http://ceb.intnet.mu/CorporateInfo/IEP2013/Executive%20Summary.pdf>

³¹ The MARENA Bill, presented before Parliament in August 2015 and passed on 29 September 2015, is provided in Annex XIIIx. A Hansard record of Parliamentary debate on the MARENA Bill on 8 September 2015 is provided in Annex XIIIx (page 88 onwards).

³² https://www.thegef.org/gef/project_detail?projID=2241

³³ <http://eemo.govmu.org/English/Pages/default.aspx>

³⁴ <http://www.afd.fr/home/pays/afrique/geo-af/maurice>

³⁵ AF Mercados (2014), *Determination of the Grid Absorption Capacity of Mauritius and Preparation of a Grid Code, Feed-in Tariffs and Model Energy Supply Purchase Agreements for Renewable Energy Systems up to 2 MW*, September 2014. See Annex IIa.

“...expansion in solar, wind and biomass energy production and other renewable energy sources”.

The NDC explicitly identifies the need for Improving Grid Absorption Capacity:

“...modernisation of the national electricity grid through the use of smart technologies, which is a prerequisite to accelerate the uptake of renewable energy.”

32. At a technical level, there can be no doubt of the need for modern grids to maximize RE uptake. As emphasised in a recent IRENA publication, *REthinking Energy* (2014), improving Grid Absorption Capacity is a prerequisite to the scale-up of grid-connected intermittent renewable energy. Similarly, the recent report from NREL, *Advancing System Flexibility for High Penetration Renewable Integration* (2015), highlights the need for multiple paths to grid load management (including load and generation management) which can only be achieved with a foundational smart grid. Thus, for RE penetration to go beyond its fringe 5-10% ‘price-taker’ role and genuinely transform energy use, a stable, strengthened, smart grid is essential.
33. PV is an intermittent source of energy. PV panels in the Mauritian context can experience a power drop of 10%/second due to passing cloud. Local environmental conditions and their impact on power generation continue to affect renewable energy capacity factors. Hence, further PV deployment depends on energy storage and management.
34. CEB budget constraints represent a significant barrier to the improvement of grid absorption capacity through investments in Battery Energy Storage Systems (BESS), ADMS and AMI. As a non-profit-making parastatal entity operating with socially-oriented electricity tariffs set by Government, CEB’s investment budget is typically limited to approximately US\$ 135 million per year.³⁶ Despite having formally indicated its intention to invest in improving Grid Absorption Capacity for intermittent renewables in 2013³⁷, CEB has not been able to do so. CEB already faces significant medium-term costs – amounting to US\$ 514 million – for unrelated investments.³⁸ Nonetheless, CEB has indicated that, should GCF support be forthcoming, it will specifically seek co-financing in the context of the GCF project in order to implement the necessary grid-strengthening measures.
35. The Small-Scale Distributed Generation (SSDG) scheme (currently in Phase 3) is now capped at 10 MW, partly for grid stability reasons but also partly for financial reasons. According to data collected during Phase 1 (the first 2 MW) and Phase 2 (the subsequent 0.94 MW) of the SSDG scheme, the levelised cost of rooftop PV-generated electricity was US\$ 0.271/kWh, compared with the levelised cost of residential grid electricity of US\$ 0.128/kWh. Moreover, the additional costs of small-scale solar PV are upfront: the US\$ 10,000 cost of installation (for a standard 2.5 kW system including PV panels, inverter and meter) is prohibitively expensive for the vast majority of Mauritian households, whose average monthly income is US\$ 699.³⁹ Without additional financial support, the payback time of a 2.5 kW system far exceeded the expected lifetime of the installed equipment, and was hence far too long to attract broad-based interest from the population (see the SSDG Phase 1 financial model in Annex IIc). The solution adopted in Phases 1 and 2 of the SSDG was to provide a feed-in tariff of US\$ 0.833/kWh, thereby shortening the effective payback time to 5 years. This feed-in tariff was withdrawn in 2012 and has been replaced by a net-metering scheme in Phase 3. Moreover, CEB analysis of Phases 1 and 2 of the SSDG scheme has since revealed that the beneficiaries of the feed-in tariff were overwhelmingly upper- and upper-middle class households. Although the FIT helped to amortise the cost of investing in PV *over time*, it failed to address the fundamental barrier facing low- and middle-income households, that of *upfront* costs. The same barrier to expanding household PV take-up applies to the net-metering scheme now underway in Phase 3.
36. An additional barrier encountered during SSDG Phases 1 and 2, and now in Phase 3, was the limited capacity within Mauritius to install and maintain small-scale PV systems. Only 15 Small- and Medium-Sized Enterprises (SMEs) had the trained staff and technical skills to be able to install PV systems, leading to a situation where they were overwhelmed by the demand. At times during Phase 1, there were delays of 12 months between a household requesting a PV system and the system being installed. If the market is to become more responsive to consumer

³⁶ <http://ceb.intnet.mu/CorporateInfo/ar2011.pdf>

³⁷ <http://ceb.intnet.mu/CorporateInfo/IEP2013/Executive%20Summary.pdf>

³⁸ CEB (2013), *Integrated Electricity Plan 2013-22*, page 115:

http://ceb.intnet.mu/CorporateInfo/IEP2013/Chapter4_Demand%20Forecast%20for%20Mauritius.pdf

³⁹ <http://www.tradingeconomics.com/mauritius/wages>

demand in the context of a Phase 4 of the SSDG, and if installation costs are to come down, investment in building the capacity of the supply-side will be required.

Baseline for Component 3: PV Mini-Grid on the Outer Island of Agalega

37. The atoll of Agalega is situated approximately 1,000 km north of Mauritius and comprises two islands (the North and South Islands) covering a total of 2,600 hectares. The Outer Islands Development Corporation (OIDC)⁴⁰ is responsible for the management and development of the islands. Agalega consists of three villages: Vingt Cinq (population 200), La Fourche (population 40) and Sainte Rita (population 60). Vingt Cinq and La Fourche are situated on the North Island, whereas Sainte Rita is situated on the South Island. Vingt Cinq has approximately 75 buildings, including houses, public buildings and offices. La Fourche consists of 15 houses and two warehouses. All the material requirements of Agalega are shipped from Mauritius.
38. While Agalega benefits from significant insolation year-round (approximately 2,000 hours per year), its electrical power is currently derived from diesel generators. Agalega consumes approximately 1,100 litres of diesel per day, necessitating replenishments by ship every month. The operation ensuring that Agalega is stocked with sufficient diesel fuel is estimated to cost OICD US\$ 22,000 every month, a significant fraction (10%) of its overall operating budget. The result is a territory that is completely dependent upon imported fossil fuel; is running an expensive energy system that prevents needed energy upgrades to schools, clinics and cold storage; and is generating needless greenhouse gas emissions. Mini-grid infrastructure is in place serving each of the three villages. A number of PV installations capable of servicing public buildings and houses exist but have been mothballed for the past 6 years (see the technical assessment in Annex IId).

C.3. Project / Programme Description

39. The project will be implemented in two phases so that funds can be disbursed in a logical and appropriate manner without burdening the GCF, the Executing Partner or the Responsible Parties. Phase 1 will be implemented between 2017-2019; Phase 2 will be implemented between 2020-2024.
40. Under Phase 1 (2017-2019), the following components will be executed:
- Component 1: Institutional strengthening for renewable energy (GCF finance: US\$ 1.1 million; co-finance: US\$ 1.08 million)
 - Component 2, Phase 1: Improving Grid Absorption Capacity followed by PV deployment (GCF finance: US\$ 10.9 million; co-finance: US\$ 20 million)
41. Phase 1 will put in place the necessary framework for further deployment of renewable energy during Phase 2. By the end of Phase 1, the Mauritius Renewable Energy Agency will be fully operational and will be contributing to the development of the energy landscape of Mauritius. CEB will have completed the centralised elements of its improvement of Grid Absorption Capacity (AGC system and batteries) and grid absorption capacity will have been substantially increased to accommodate a total of 185 MW of intermittent RE.
42. Under Phase 2 (2020-2024), the following components will be executed:
- Component 2, Phase 2: Improving Grid Absorption Capacity and PV deployment (GCF finance: US\$ 15.4 million; co-finance: US\$ 140.9 million)
 - Component 3: PV mini-grids on the Outer Island of Agalega (GCF finance: US\$ 0.81 million; co-finance: US\$ 1.2 million)
43. Phase 2 will build on experiences obtained and frameworks put in place in Phase 1 in order to accelerate the deployment of PV. The PV systems installed under Phase 4 of the SSDG scheme will enable the visibility of the GCF project to be scaled-up, with an expected ~3,927 beneficiaries across all user categories. 25 MW of rooftop PV will be on the (strengthened) grid. The three villages of Agalega will be supplied with clean energy, thereby becoming an example for all SIDS.

Component 1: Barrier Removal

⁴⁰ <http://localgovernment.govmu.org/English/Pages/outer%20Island/stbrandon.aspx>

44. With the assistance of the GCF project, MEPU will receive the necessary assistance to develop a fit-for-purpose legal and regulatory framework to allow the ambitious scale-up of renewable energy in Mauritius. GCF funding will also be used to develop a staffing plan/structure for MARENA that is aligned with the needs of the Long-Term Energy Strategy; to develop a secondment strategy that will allow experienced CEB and MEPU staff to work at MARENA for limited periods (e.g. 1-2 years), thereby building capacity quickly; and to establish South-South links with other energy regulators, notably in India and South Africa. With GCF support, MARENA will be empowered and fully operationalised to assist renewable energy (RE) investors, particularly Independent Power Producers (IPPs), in reducing the transaction costs and time delays currently associated with RE investments. MARENA will also provide technical oversight and policy planning support.

45. The Government has earmarked approximately US\$ 500,000 in the current budget (2015-2018) to establishing MARENA. However, this is insufficient if the Agency is to live up to its market-catalytic potential. Incremental GCF support of US\$ 1.1 million will ensure this potential is met.

Component 1: Goals and Anticipated Outcomes

46. The principal outcome of Component 1 will be the emergence of a strengthened institutional and regulatory system for renewable energy in Mauritius, which will directly facilitate the implementation of Component 2. By the end of Component 1 (2019), the Government will have the required legal texts, systems and institutional capability to effectively manage the evolution and growth of the renewable energy sector. The promotion of renewable energy technologies and a better understanding of the sector from an investor’s perspective are expected to result in reduced GHG emissions through the scale-up of renewable power generation, both centralised and decentralised, at a national scale.

Component 2: Barrier Removal

47. Currently, the national grid is only able to accept 60 MW of intermittent renewable energy. With the assistance of the GCF project, CEB will be enabled to acquire and install the equipment necessary to raise the acceptable level by 125 MW – i.e. so that, in total, 185 MW of intermittent renewable energy can be connected to the grid without jeopardising grid stability.⁴¹ The GCF project will provide technical and financial support to the required improvement in Grid Absorption Capacity through US\$ 10.9 million of GCF finance and US\$ 20 million of co-finance (US\$ 1 million grant from UNDP, US\$ 17 million of concessional lending from AFD and a contribution of US\$ 2 million from CEB).

48. 25 MW of this new intermittent renewable power will be supplied by rooftop PV installations facilitated through a GCF-supported Phase 4 of the SSDG scheme, which will target households, NGOs and public buildings (see Table 6 below). All Phase 4 PV installations will be governed by the terms of the Small-Scale Distributed Generation grid code (installations up to 50 kW – see Annex XIIIb) or by the Medium-Scale Distributed Generation grid code (installations between 50 kW-2 MW – see Annex XIIIc and XIId). These grid codes were developed by CEB with UNDP assistance and were formally introduced in 2014. The remaining 100 MW of renewable energy capacity⁴² will be installed by CEB and Independent Power Producers at utility-scale (installations greater than 2 MW) according to CEB’s standard tender process.⁴³ Over 39 MW of such utility-scale power has already been pipelined but has been unable to proceed because of the grid stability constraints.

49. To be clear, the GCF project will facilitate a total capacity of 185 MW of renewable energy on the Mauritian grid through its support to improving Grid Absorption Capacity. Of this 185 MW, 25 MW will be directly facilitated by the GCF project through its support to a fourth phase of the SSDG scheme. The GCF project will enable the residual 100 MW (through improving Grid Absorption Capacity) but will not be directly involved in financing or supporting these utility-scale installations.

Table 4: SSDG Phase 4 User Categories

Category of User	Total MW Allocated	Number of Beneficiaries	Average Size of System
Households	10 MW	2,800 – 5,000	2 kWp – 3.5 kWp
NGOs	4 MW	8 – 20	200 kWp – 500 kWp

⁴¹ In the case of intermittent renewables, it is the stability of power system frequency that is of principal concern.

⁴² The grid will be enabled to handle 185 MW of intermittent renewable energy in total. 60 MW of such capacity is already on the grid and the SSDG Phase 4 scheme will, with GCF support, result in a further 25 MW of installations – leaving 100 MW of additional RE capacity to be provided by CEB and IPPs.

⁴³ <http://ceb.intnet.mu/tenders/TenderList.asp>

Public buildings (including schools, charitable institutions, orphanages, bus shelters, etc.)	11 MW	1,400 – 2,200	5 kWp
Total	25 MW		8 kWp – 14 kWp

50. GCF resources will be used to provide a grant to SSDG Phase 4 users to partially cover the upfront cost of investing in small- and medium-scale PV systems. For households, NGOs and public buildings, the grant will cover an average of approximately 27% of the upfront system and installation cost (with the balance coming from loans (AFD) or users' own resources), as it is considered to be a more equitable approach than a FiT (which will be discontinued in Phase 4 of the GCF-supported SSDG scheme)⁴⁴ to ensure scaled-up adoption of small-scale PV.

- The eligibility of beneficiary households will be determined by CEB using established (not project-specific) rules and criteria in terms of: (a) the income level of the beneficiary household and (b) technical compliance of the proposed rooftop PV system with CEB requirements (grid capacity, solar radiation, health and safety, metering set-up, etc.) under the technical rules of the SSDG Scheme.
- Households will be selected on a first-come, first-served basis in defined consumer categories. A 50% quota for low-income households will be reserved in SSDG Phase 4 until 2022, and the rest for middle-income households, as defined by the Household Budget Survey of Statistics Mauritius. The Social Register will be used to target the low-income households. The proxy means test used by UNDP for the Social Register project⁴⁵ will be adapted to identify and restrict beneficiaries to lower socio-economic classes of Mauritian society. The term 'proxy means test' is used to describe a situation where information on household or individual characteristics correlated with welfare levels is used in a formal algorithm to proxy household income, welfare or need. The Proxy Means Test is already used to identify and assess eligibility for the new 'Child Allowance' Scheme and a Social Register software system has been developed to register and assess applications for social benefits.
- A Sub-Board (for Component 2) will oversee the quota for each category, taking into account level of income, gender, geographical coverage, and consumption of electricity. The quota definition will be objective and transparent. The list of beneficiaries will be submitted to the GCF as part of the M&E process.
- No grants will be made to the households themselves. CEB will receive GCF funds from UNDP under the standard National Implementation Modality (NIM), since CEB will be a Responsible Party of the project. CEB will be responsible for the purchase and installation of the GCF-supported PV systems, with installation work typically sub-contracted to private-sector installation firms. The payment contribution from the GCF to CEB for each PV-enabled household (27% of the total cost) will be made upon successful commissioning of the household's PV system, as checked by an independent verifier. This 27% cost saving will, in turn, be passed onto the household. The household therefore benefits from a lower upfront cost of adopting PV but no GCF monetary transfers take place between either UNDP or CEB and the household.
- The same approach – i.e. first-come, first-served and compliant with CEB specifications – will be launched for the other user categories (public buildings and NGOs), with caps on the maximum PV capacity to be installed in each category as shown in Table 6.
- During implementation, gender-disaggregated data will be collected, along with other indicators of vulnerable households. If the first tranche of SSDG Phase 4 implementation does not provide sufficiently diversified take-up by a cross-section of Mauritian society, the selection criteria will be adjusted towards favouring target groups in subsequent tranches.

51. Overall, these grant resources will represent just ~6% of the total investment cost associated with the expected 185 MW of renewable energy to be installed by 2023. In addition to the upfront grant provided by GCF resources, AFD will, if the GCF project is approved, establish a loan scheme for PV adopters under SSDG Phase 4 so that the residual

⁴⁴ SSDG Phase 4 adopters – small-scale IPPs – will function under the Net Metering Scheme: their PV-generated electricity will be exported to the grid and will offset their monthly energy imported from the grid; excess energy will be banked in the form of kilowatt-hour (kWh) credits. These credits can be used when the customer's system is not generating enough electricity to meet her/his demand and can be cashed at the end of the contract.

⁴⁵ http://www.mu.undp.org/content/mauritus_and_seyelles/en/home/ourwork/povertyreduction/successstories/SRMsuccessstory.html.

(post-grant) purchase price of the PV systems can be borrowed and then repaid in installments. The AFD loan will be at 2.86% assuming current Euribor levels.

52. On the island of Mauritius, the small size of the power system poses two problems: first, the loss of a single component (such as a generator) represents a significant portion of the total load and, second, the system has low inertia and is therefore more sensitive to generation/load changes. For a power system with these characteristics and a high penetration of intermittent renewable energy, such as solar power, the system is even more exposed to frequency instability due to the volatile power output. Based on a comprehensive suite of technical studies⁴⁶, CEB, with the help of the GCF and AFD, will implement a number of technology-oriented Grid Absorption Capacity solutions to maintain grid stability while allowing greater injections of renewable electricity. These solutions will include the Battery Energy Storage System (BESS), Automatic Generation Control (AGC), the Advanced Distribution Management System (ADMS) and Advanced Metering Infrastructure (AMI).
53. AGC will allow CEB to perform instantaneous secondary frequency control following frequency excursions outside the allowable limits of 50Hz \pm 1.5%. While AGC will enable effective management of the secondary frequency control for grid stability, the primary frequency control following a sudden loss of, or reduction in, generation from renewable power sources will be mitigated with the installation of BESS, which has a reaction time of less than 20ms. The ADMS will include deployment of a centralised self-healing Fault Location, Isolation, and System Restoration function along with deployment of communicable fault passage indicators and sectionalisers on MV feeders such that the sectionalisers, in the form of recloser and load break switches, can be monitored and controlled from CEB's SCADA⁴⁷ system. This will be accompanied by deployment of communicable shunt capacitors and voltage regulators (as may be necessary) on MV feeders capable of being monitored and controlled from CEB's SCADA system. By reinforcing the structural efficiency of the grid, transmission and distribution losses will be minimised and more intermittent renewable energy can be accommodated. In addition, a centralised Outage Management function will be deployed that will allow last-gasp messages from smart meters (provided as part of CEB's non-GCF-funded AMI programme) to infer the location of faults on CEB's LV network, allowing crews to be dispatched to resolve LV fault conditions and restore power as quickly as possible (including validation of restoration by pinging any fault-associated smart meters).
54. GCF funds will contribute to the cost of the BESS in conjunction with CEB and AFD co-financing. GCF will co-finance the AGC in conjunction with AFD. GCF will co-finance the ADMS with AFD. The AMI (i.e. smart meters and associated equipment) will not be supported by the GCF but will, rather, be financed entirely by CEB and AFD.

Component 2: Goals and Anticipated Outcomes

55. Implementation of this component will result in reduced GHG emissions through increased access to low-emission energy and power generation. By the end of Component 2, 161,600 tCO₂e will have been directly avoided due to the installation of 25 MW PV directly assisted by the GCF project. An additional 3.2 million tCO₂e are expected to be indirectly avoided as a result of expansion of intermittent renewables permitted by the improvement of Grid Absorption Capacity activities. Taken over the entire population of Mauritius and Rodrigues (396,335 households), Component 2 will enable one-third (129,500) of households to have access to low-emission energy.

Component 3: Barrier Removal

56. The argument for introducing PV power on Agalega is very clear. As outlined in a PV assessment study commissioned by UNDP in 2010 (Annex IId) and a later costing study (Annex IJe), with Agalega's insolation and electricity demand profile, hybrid mini-grids⁴⁸ serving the three villages could source ~80% of their electricity from solar power, requiring only relatively minor injections of diesel power. This would result in financial savings to OIIC of US\$ 106,000 per year – resources that OIIC is committed to allocating to long-term upkeep and expansion if given the opportunity. The principal barrier preventing the three villages of Agalega from operating solar-diesel hybrid mini-grids is technical capacity. A number of PV systems have been mothballed since 2009 because of a lack of trained technicians to maintain the system.

Component 3: Goals and Anticipated Outcomes

57. The principal goal of Component 3 will be to transform Agalega into the first low-emission inhabited island in the Republic of Mauritius. Approximately 300 inhabitants will benefit from this development, which will involve

⁴⁶ See Annexes IIa, IIb, IIc, IIh and IIi in particular.

⁴⁷ SCADA: Supervisory Control and Data Acquisition.

⁴⁸ A 150 kW hybrid mini-grid in Vingt Cinq and 75 kW hybrid grids in La Fourche and Sainte Rita.

rehabilitation of the existing PV systems where feasible, and the installation of an additional 300 kW of PV panels and accompanying battery storage (diesel will only be required as back-up) on the existing mini-grid infrastructure. Training will be provided to 3 technical staff on the island and an additional 5 staff on the mainland to act as back-up and to provide logistical support in the event of new equipment being required. The total cost of these interventions will be US\$ 2.1 million, partially financed by the GCF (US\$ 818,000) and partially from co-finance (US\$ 1.2 million). Component 3 will build on the PV knowledge, stakeholder networks and market momentum acquired through Components 1 and 2. Furthermore, there is a broader demonstration value associated with the situation of Agalega for other remote SIDS (such as Kiribati, Niue, etc.), as Agalega exemplifies the SIDS characteristics of a highly vulnerable island, highly reliant on fossil fuels.⁴⁹

C.4. Background Information on Project / Programme Sponsor

58. The Executing Entity of the overall project will be the GCF National Designated Authority, the Ministry of Finance and Economic Development (MOFED). Operational responsibility for executing each component will be delegated to the relevant institutions ('Responsible Parties'):

- Component 1: Ministry of Energy and Public Utilities
- Component 2: Central Electricity Board
- Component 3: Outer Islands Development Corporation

Ministry of Finance and Economic Development (MOFED)⁵⁰

59. The Ministry of Finance and Economic Development – which employs 393 staff, including 10 in the Development Cooperation Section and dedicated sector management teams – is responsible for coordination of all development partners, including multilateral funding agencies, with regard to external assistance, including budget support programmes, grants, loans and technical assistance. All such external assistance is overseen by the Resource Mobilisation, Development Cooperation and Regional Initiatives Directorate of the Ministry. This Directorate consists of a Director (who also serves as the GCF NDA) and 10 professional staff. MOFED also contains Sector Management and Support Teams (SMSTs). The Resource Mobilisation, Development Cooperation and Regional Initiatives Directorate and the SMST for Renewable Energy have been heavily involved in the formulation of the GCF project proposal, as have the other organisations listed below.

Ministry of Energy and Public Utilities (MEPU)⁵¹

60. MEPU has the mandate to formulate policies in the energy, water and wastewater sectors, and to maintain a responsive legal framework to govern these sectors. The Ministry employs 54 professional staff and has a long track record of implementing strategic energy projects: notable examples in recent years include operationalisation of the Energy Efficiency Management Office, the SSDG scheme and feasibility studies for wind projects. MEPU has been the executing partner of a number of UNDP projects, including the GEF-financed 'Removal of Barriers to Energy Efficiency and Energy Conservation in Buildings' project⁵² (2008-14) and the SIDS-DOCK-financed 'Energy Efficiency and Renewable Energy in Mauritius' project (2012-16).⁵³

Central Electricity Board (CEB)⁵⁴

61. The Central Electricity Board is a parastatal entity established under the CEB Act (1964).⁵⁵ CEB is responsible for generation (in collaboration with IPPs), transmission and distribution of electricity in Mauritius. CEB employs over 600 professional staff, including a dedicated Small-Scale Distributed Generation Department consisting of 4 staff who

⁴⁹ The only other Outer Island that could be addressed in the Republic of Mauritius is St Brandon. However, St Brandon is only inhabited intermittently by fishermen and does not have any infrastructure. In contrast, Agalega does have a permanent population of 300 and mini-grids serving each village that only need to be slightly upgraded. The larger, semi-autonomous island of Rodrigues (which is not considered an Outer Island by the Constitution of Mauritius) accounts for 3% of the total population of Mauritius and has a strong political desire to have 100% RE electricity supply. Rodrigues is served by the Central Electricity Board (not by the Outer Islands Development Corporation) and is already included in the GCF project: the GCF-supported Small Scale Distributed Generation (SSDG) Phase 4 programme (Component 2) will cover the main island of Mauritius and the island of Rodrigues. Approximately 3-5% of SSDG Phase 4 PV installations will be in Rodrigues.

⁵⁰ <http://mof.govmu.org/English/Pages/default.aspx>

⁵¹ <http://publicutilities.govmu.org/English/Pages/default.aspx>

⁵² https://www.thegef.org/gef/project_detail?projID=2241

⁵³ <http://sidsdock.org/financial-resources>

⁵⁴ <http://ceb.intnet.mu/>

⁵⁵ <http://attorneygeneral.govmu.org/English/Documents/A-%20Acts/C/Page%201/CENTRAL%20ELECTRICITY%20BOARD%20ACT,%20No%2032%20of%201963.pdf>

manage the SSDG scheme. CEB has extensive experience managing multi-million – and, in some cases, multi-billion – rupee projects. CEB is currently executing the GEF-financed ‘Removal of Barriers to Solar PV Power Generation in Mauritius, Rodrigues and the Outer Islands’ project (2011-16).⁵⁶

Outer Islands Development Corporation (OIDC)

62. The Outer Islands Development Corporation Act No. 41 of 1982⁵⁷ provides that the Corporation shall be responsible for the management and development of the Outer Islands (i.e. all of the island comprising the State of Mauritius other than the islands of Mauritius and Rodrigues). Agalega and the Cargado Carajos group of islands (St. Brandon) fall under OIDC’s jurisdiction. The Corporation employs 175 staff, of whom 150 work on issues relating to Agalega. OIDC will execute Component 3 of the GCF project jointly with CEB and the Energy Services Division of the Ministry of Public Infrastructure and Land Transport.

C.5. Market Overview (if applicable)

Renewable Energy

63. Mauritius has been experiencing growing electricity demand since its independence in 1968. CEB, in its Integrated Electricity Plan (IEP) 2013-2022 under the business-as-usual scenario, estimates that electricity demand for the next 8 years will grow at a compound annual rate of 2.7%.

Provide the key competitors with market shares and customer base (if applicable).

64. CEB, as mandated by the CEB Act 1964, is the sole entity responsible for electricity transmission, distribution and sales. However, a number of IPPs are actively involved in power generation. To effectively manage power sector operations, PPAs and ESPAs are agreed between CEB and the IPPs for the supply of electrical energy to the grid, which CEB subsequently sells to end-users. As of mid-2015, there are 7 major IPPs supplying electricity to the grid, mostly using landfill gas and bagasse.

Provide pricing structures, price controls, subsidies available and government involvement (if any).

65. Electricity prices⁵⁸ for end-users are based on CEB development plans. The last tariff revision was carried out in 2010 and the price of electricity has remained unchanged since then. In general, producer prices in the power sector are agreed, following negotiation, between the service provider (CEB) and the IPPs. The purchase prices are governed by mutually-binding PPAs and ESPAs. The purchase prices of power are eventually *pass-through* to end-users. In previous contracts, Government guarantees have been used to hedge against the risk of CEB default. Electricity tariff increases require the Government’s prior approval.

66. The SSDG scheme launched in 2010 included a feed-in tariff (FiT) as part of a broader revised Grid Code for small-scale RE generation (Annex XIIIa). The FiT was targeted specifically at Small Independent Power Producers (SIPPs) and was formulated on the basis on an internal rate of return (IRR) of 7.5% for the SIPPs (mainly households) over 15 years.

C.6. Regulation, Taxation and Insurance

General

67. The Environment Protection Act (EPA) 2002 (amended 2008)⁵⁹ provides the legislative and administrative framework for the protection and preservation of the environment. Under the EPA, power generation and transmission activities are required to have an environmental impact assessment (EIA). However, due to the type and scale of the small-scale rooftop PV systems and Agalega mini-grids being proposed under the GCF project, these components are exempted from an EIA. This exemption was confirmed in writing on 1 July 2015 by the Director of Environment, Ministry of Environment, Sustainable Development, Disaster and Beach Management (see Annex VIb).

68. Waste that may be generated by the project, notably rooftop PV panels at the end of their lifetimes, will be subject to the relevant Local Government Regulations and Environmental Protection Regulations of Mauritius. Working

⁵⁶ https://www.thegef.org/gef/project_detail?projID=4099

⁵⁷ <http://attorneygeneral.govmu.org/English/Documents/A-Z%20Acts/O/OUTERISLANDSDEVELOPMENT1.pdf>

⁵⁸ <http://ceb.intnet.mu/tariffs/Overview.asp>

⁵⁹ <http://attorneygeneral.govmu.org/English/Documents/A-Z%20Acts/E/Page%201/ENVIRONMENT%20PROTECTION%20ACT,%20No%2019%20of%202002.pdf>

conditions will comply with the relevant provisions set forth in the Occupational Health and Safety Act 2005⁶⁰, Labour Act 1975⁶¹, Employment Rights Act 2008⁶² and the Equal Opportunities Act 2008.⁶³

69. Mauritius is a low-tax regime jurisdiction. A flat rate of 15% is applied for both income tax (for individuals) and corporate tax. In addition to these taxes, a 15% value-added tax is raised on all purchases, except for some exempted goods and services.⁶⁴ Projects financed by international development partners are eligible for VAT refunds.⁶⁵ There is no restriction on foreign exchange (FX) in Mauritius.⁶⁶

Specific

70. There are neither customs/excise duties nor Value Added Tax on PV panels. As per current legislation, consultants are subject to personal income tax on any income sourced from Mauritius unless there is specific exemption provision in the Double Taxation Avoidance Agreement with the country of residence of the international consultant. Donor funding is not subject to VAT but employees of the project will be subject to income taxation.

C.7. Institutional / Implementation Arrangements

71. The project will be implemented following UNDP's National Implementation Modality (NIM), according to the Standard Basic Assistance Agreement (SBAA) between UNDP and the Government of Mauritius signed in 1974 and the Country Programme Document (CPD).⁶⁷ The GCF project has been officially endorsed by the National Designated Authority, the Ministry of Finance and Economic Development (MOFED) – the Letter of No Objection is provided in Annex Ia. MOFED will oversee the project execution and ensure that it is implemented in accordance with the applicable national policies.

72. The Implementing Partner in UNDP terminology – the Executing Entity in GCF terminology – is the entity responsible and accountable for managing the project, including the monitoring and evaluation of project interventions, achieving project outcomes, and for the effective use of UNDP/GCF resources.

73. The Implementing Partner may enter into agreements with other organisations or entities, namely Responsible Parties, to assist in successfully delivering project outcomes. A Responsible Party is defined as an entity that has been selected to act on behalf of the Implementing Partner on the basis of a written agreement or contract to purchase goods or provide services using the project budget. In addition, the Responsible Party may manage the use of these goods and services to carry out project activities and produce outcomes. All Responsible Parties are directly accountable to the Implementing Partner in accordance with the terms of their agreement or contract with the Implementing Partner.

74. Responsible Parties for each component under the GCF project are:

- Component 1: Ministry of Energy and Public Utilities
- Component 2: Central Electricity Board
- Component 3: Outer Islands Development Corporation

75. The management arrangements for the project are summarised in the chart below and in Annex XIIIam:

⁶⁰ <http://labour.govmu.org/English/Legislations/Pages/OSHA-2005-and-Regulations.aspx>

⁶¹ <http://labour.govmu.org/English/Legislations/Pages/Labour-Act.aspx>

⁶² <http://labour.govmu.org/English/Legislations/Pages/Employment-Rights-Act-2008-and-Regulations.aspx>

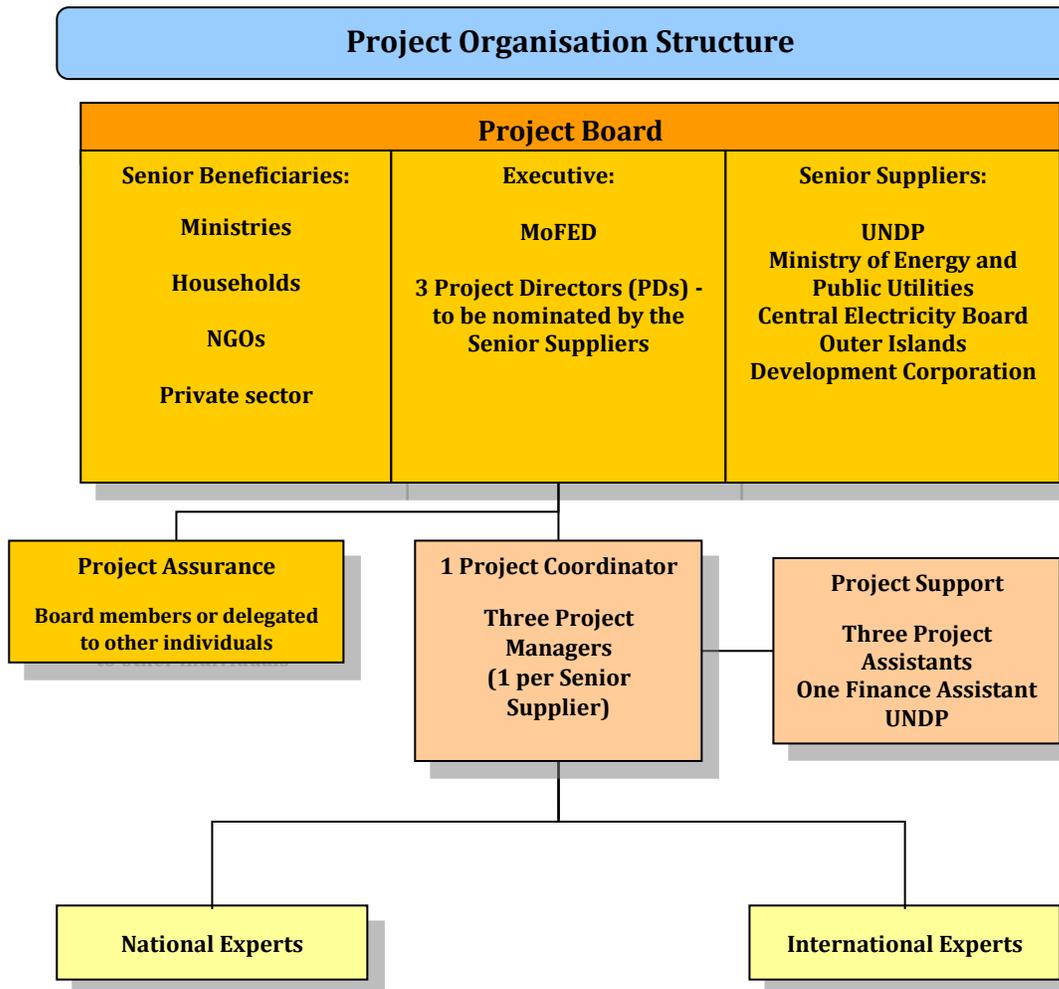
⁶³ <http://eoc.govmu.org/English/Know%20Your%20Rights/Pages/Scope-of-the-Law.aspx>

⁶⁴ Details are available on the Mauritius Revenue Authority website: <http://www.mra.mu/>.

⁶⁵ http://budget.mof.govmu.org/budget2016/2016_28_1_CentrallymanagedInitiatives.pdf (page 367).

⁶⁶ Useful information on taxes and FX in Mauritius can be found in World Bank (2014), *Doing Business 2015 – Going Beyond Efficiency: Mauritius Economy Profile*, <http://www.doingbusiness.org/reports/global-reports/doing-business-2015>.

⁶⁷ The SBAA is provided in Annex XIIIu. The CPD is provided in Annex XIIIv.



76. The Project Board is the group responsible for making, by consensus, management decisions for the project when guidance is required by the Project Coordinator, including recommendation for UNDP / Implementing Partner approval of project plans and revisions. In order to ensure UNDP's ultimate accountability, Project Board decisions will be made in accordance with standards consistent with UNDP operating policies and procedures and, in particular, standards that shall ensure management for development results, best value for money, fairness, integrity, transparency and effective international competition. In case a consensus cannot be reached within the Board, the final decision shall rest with the UNDP Programme Manager. The Project Board will meet on a semi-annual basis and will be responsible for decisions including:

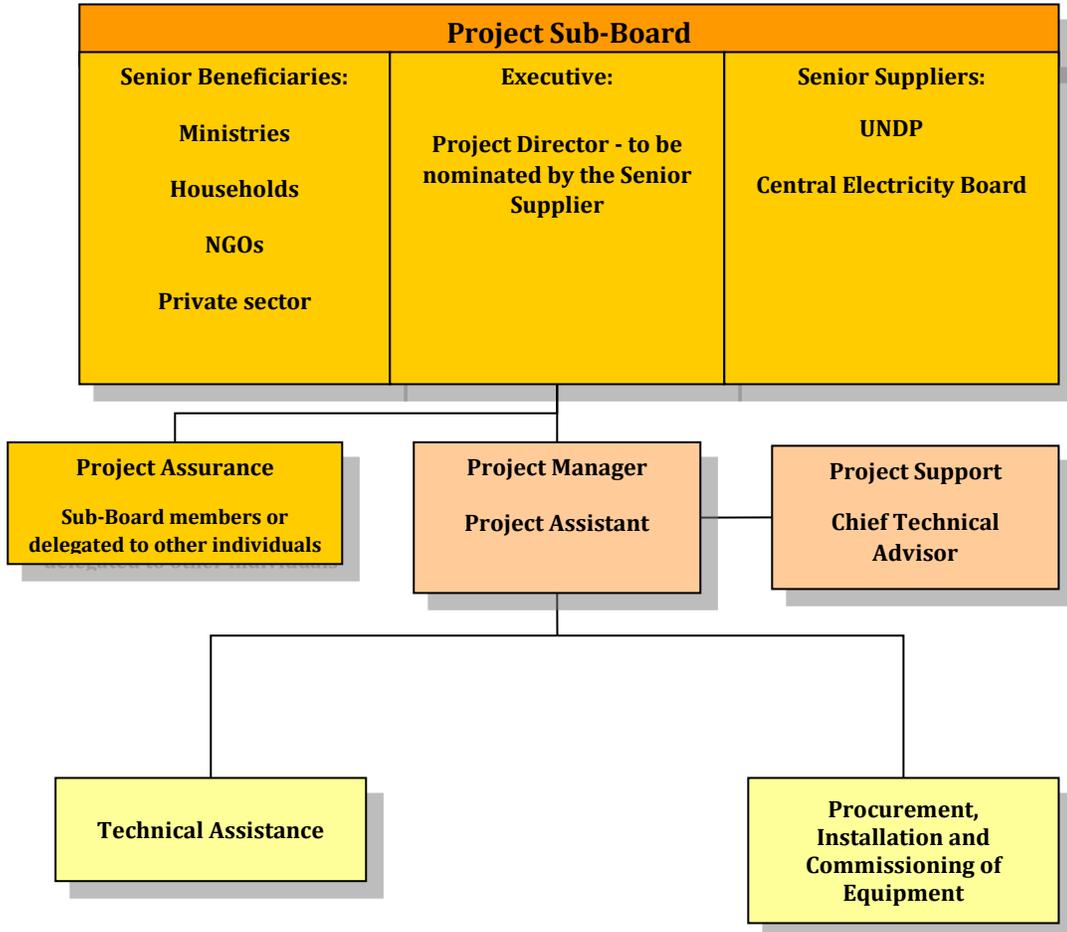
- Subject to a first-level approval by the Project Sub-Board, the Project Board will provide a second level of approval for the budget and workplans under each component to ensure that the project is executed in a timely manner and delays at component level are minimised.
- Triggering the project mid-term and final evaluations (year 3, year 5 and year 8) and approval of the reports for submission to the GCF.
- Ensuring that the Project Sub-Boards are properly composed with respect to GCF policies on gender and civil society involvement.
- Providing a discussion forum to facilitate matters when/if Project Sub-Boards are unable to progress.
- Decisions on recruitment and contract extension decisions for project staff.

77. Each project component will be overseen by a Project Director. Each Project Director will chair a Project Sub-Board focused on a specific project component. Each Sub-Board will consist of relevant stakeholders, and will be detailed

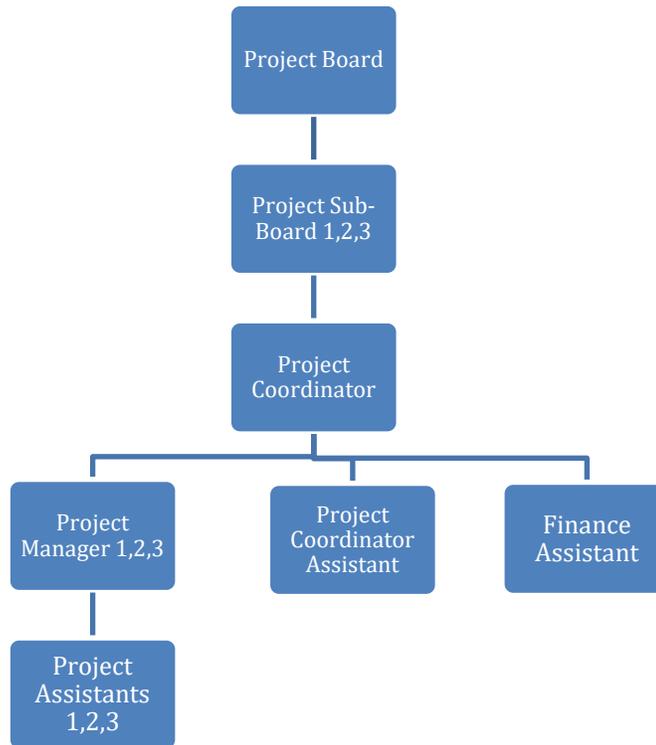
in the UNDP Project Document. As with the Project Board, each Sub-Board is responsible for making, by consensus, management decisions when guidance is required by the Project Coordinator and/or relevant Project Manager. Project Sub-Board decisions will be made in accordance with standards that shall ensure management for development results, best value for money, fairness, integrity, transparency and effective international competition. In case a consensus cannot be reached within a Sub-Board, final decisions shall rest with the Project Board. Each Project Sub-Board will meet on a quarterly basis.

78. Project assurance is the responsibility of each Board and Sub-Board member; however, the role can be delegated. The project assurance role supports the Project Board and Sub-Boards by carrying out objective and independent project oversight and monitoring functions. This role ensures appropriate project management milestones are managed and completed. Project Assurance has to be independent of the Project Coordinator and Project Managers; therefore, the Project Board and Sub-Boards cannot delegate any of their assurance responsibilities to the Project Coordinator or Project Managers. A UNDP Programme Officer typically holds the Project Assurance role on behalf of UNDP. In addition, the UNDP-Global Environment Finance Unit in the Regional Service Centre (Addis Ababa) provides oversight and quality assurance support.
79. UNDP's overall role as an Accredited Entity is to provide oversight and quality assurance through its Headquarters, Regional and Country Office units. This role includes: (i) project preparation oversight; (ii) project implementation oversight and supervision, including financial management; and (iii) project completion and evaluation oversight. It also includes oversight roles in relation to reporting and knowledge-management. The 'project assurance' function of UNDP is to support the Project Board by carrying out objective and independent project oversight and monitoring functions. This role ensures appropriate project management milestones are managed and completed. The 'senior supplier' role of UNDP is to represent the interests of the parties that provide funding and/or technical expertise to the project (designing, developing, facilitating, procuring, implementing). The senior supplier's primary function within the Board is to provide guidance regarding the technical feasibility of the project.
80. At component level, the governing entity is the Project Sub-Board constituted as per the organogram below (example given for Component 2):

Typical Component-Level Organisation Structure



81. Terms of reference for Project Management Unit staff are provided in Annexes XIIIk – XIIIl. The function of the Project Management is shown diagrammatically below:



82. The *Project Coordinator*, based at the UNDP Country Office or at the Ministry of Finance and Economic Development (final decision to be made at the inception stage), will be responsible for the overall coordination of the project, timely recruitment of the four project managers by UNDP, and will ensure UNDP's support in all aspects of the project. UNDP will aim to ensure that there is the necessary synergy between the different project components. The Project Coordinator will quality-assure monitoring and evaluation documentation submitted to the GCF and will review annual budgets submitted by the Project Managers before transmission to the Project Directors. The Project Coordinator will be responsible for liaising with the relevant Project Directors and ensuring that the Project Managers deliver on their respective mandates, identify bottlenecks and bring a problem-solving approach to the delivery of the project. The Project Coordinator will also be responsible for mobilising the relevant UNDP support in respect of relevant operational aspects of the project. The Project Coordinator will be accountable to the Project Board for project execution. The Project Coordinator will have to inform the Board where there are grounds to believe that activities are not proceeding at the required pace and what remedial actions are required. The Project Coordinator will be employed on one-year renewable contracts and it will be the Board's decision whether extension of the contract is warranted each year.
83. The *Project Managers* will run their respective components on a day-to-day basis on behalf of the relevant Responsible Party within the constraints laid down by the Board and the Sub-Boards. The Project Manager function will end when the final project evaluation report, and other documentation required by the GCF and UNDP, has been completed and submitted to UNDP for the component under his/her responsibility. The Project Manager is responsible for day-to-day management and decision-making for his/her project component, as well as monitoring materialized co-finance and reporting on this at project Sub-Board meetings. The Project Manager's prime responsibility is to ensure that the component produces the results specified in the Project Document, to the required standard of quality and within the specified constraints of time and cost. The relevant Responsible Party appoints the Project Manager, who should be different from the Responsible Party's representative on the Project Board and Sub-Board. Prior to the approval of the project, the Project Developer role is held by the UNDP staff member responsible for project management functions until the Project Coordinator and Project Managers are in place.
84. The three Project Managers will sit respectively at:

- The Ministry of Energy and Public Utilities (for Component 1)
- The Central Electricity Board (for Component 2)
- The Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer islands (for Component 3)

85. Under the overall guidance of the National Project Director and the direct supervision of the Project Coordinator, the *Project Coordinator Assistant* will provide project support services, ensuring high quality, accuracy and consistency of work. The Project Coordinator Assistant will work in close collaboration with the project and project staff as well as operations in the UNDP CO, UNDP Regional Service Centre and UNDP HQ as required and to exchange information and support project delivery.
86. Under the guidance and direct supervision of the Project Coordinator, the *Finance Assistant* will provide leadership in execution of financial services for the GCF project, ensuring effective and transparent utilisation of financial resources and integrity of financial services. The Finance Assistant will promote a client-oriented approach consistent with UNDP rules and regulations as well as those of the GCF. He/she will ensure full compliance with UN/UNDP rules, regulations and policies of financial activities, the financial recording/reporting system, follow-up on audit recommendations, implementation of effective internal controls, and proper functioning of a client-oriented financial resources management system.
87. UNDP being the GCF Accredited Entity, the UNDP Country Office will receive the GCF funds from UNDP Head Office on the basis of approved Annual Work Plans. When payments are to be effected by UNDP, the treasury and cashier functions will be performed by the UNDP Mauritius Country Office Finance Department. At the level of each participating organisation (Responsible Party), in order to receive the funds advanced by UNDP the Responsible Parties for the project may open bank accounts to be used only for receiving UNDP advances and to make payments relating to their respective project component. The Project Coordinator will approve requests for cash advances to the individual project components on a quarterly basis. Once in the account of the Responsible Parties, the latter's treasury systems (i.e. the Government or CEB treasury system) will be responsible for disbursement in accordance with approved work plans. The Government of Mauritius and CEB have well established treasury functions which operate in compliance with international norms and are audited annually by the National Audit Office. All expenditures by the project using advances given by UNDP must be made in accordance with the procurement and contracting procedures agreed in the project document, and must be related to the project activities and outputs envisaged in the annual work plan.
88. GCF funds will not be used to pay the salaries of Government personnel, whose costs will be fully covered by the relevant Responsible Parties. The Project Directors will be assigned by the Government/CEB and will be paid by Government/CEB as they are full-time senior officers. The Project Coordinator, Project Managers, Project Coordinator Assistant, Project Assistants and Finance Assistant will be paid using GCF funds.

Small-Scale Distributed Generation – Phase 3

89. The funds for the next cohort of SSDG installations will be transferred to CEB on a quarterly basis. For the US\$ 12.7 million of GCF funds⁶⁸ allocated to the SSDG scheme (grants to partially cover the upfront costs of PV system acquisition), approximately US\$ 138 million more are expected to be leveraged at minimum. This co-finance will consist of: (a) the residual cost of each PV system not covered by the GCF (of which, 37% is expected to be covered by AFD loans, the remainder through user self-financing) and CEB's payments (at marginal cost) to Small Independent Power Producers (SSIPs) for the electricity supplied by the SSIPs to the grid (US\$ 119 million in total). SSIP applicants (for example, households) will submit their application forms to CEB, which will then send its verification team to the applicant's premises to ensure that the installation complies with the Grid Code. Once CEB has carried out its verification, it will send the information to MEPU so that the Ministry may issue the SSDG licence. From that point onwards, the CEB SSDG Unit will, on a monthly basis, assess the amount of electricity produced by the SIPP and credit its electricity account on a net-metering basis.

⁶⁸ Exclusive of project management costs and agency fees.

C.8. Timetable of Project/Programme Implementation

Please provide a project/programme implementation timetable in [section I \(Annexes\)](#). The table below is for illustrative purposes. If the table format below is used, please refer to the activities as numbered in Section H. In the case of outputs, please mark when all the required activities will be completed.

90. Please see Annex X.

D.1. Value Added for GCF Involvement

Please specify why the GCF involvement is critical for the project/programme.

91. The additionality of the proposed GCF funding for Components 2 and 3 has been analysed as an aspect of the financial analysis conducted for each of these components. Details of this additionality assessment are provided in Annex XII and are summarised here.
92. For Component 2 (the Improving Grid Absorption Capacity element), the investment is not financially viable (the Financial Internal Rate of Return, FIRR, is lower than the hurdle rate) if the GCF grant is less than the proposed US\$ 13.6 million (38.5% of total project cost).⁶⁹
93. For Component 2 (SSDG Phase 4 element), the investment is not financially viable (the FIRR is lower than the hurdle rate) if the GCF grant is less than the proposed US\$ 12.7 million (27.2% of total project cost). It is to be noted that the capital subsidy for these grid-connected solar PV installations, which is 27.2% of the total cost of installation, is consistent with the general subsidy level offered in other developing countries, such as India.
94. For Component 3 (Agalega PV mini-grids), the estimated revenues collected from households is low since these are poor and vulnerable households living in a remote island, and these revenues cover just 5% of the installation's operational costs. Given the public good nature of this component, serving a remote and vulnerable community, it is recommended that a GCF grant completely covers the capital costs of this installation.

D.2. Exit Strategy

Component 1: Institutional Strengthening for Renewable Energy

95. The Mauritius Renewable Energy Agency will be underpinned by a legal framework and an annual budget from Government, using a similar model to that adopted for the Energy Efficiency Management Office (EEMO) which was set up under the UNDP-supported, GEF-financed 'Removal of Barriers to Energy Efficiency and Energy Conservation in Buildings' project. The long-term sustainability of MARENA will be assured through its mandate, as embodied in national law.

Component 2: Improving Grid Absorption Capacity and PV deployment

96. The move to greater integration of intermittent renewables cannot be a short-term measure as the contracts that will be entered into with the Phase 4 SSDG Small Independent Power Producers (SIPPs) will be over 15 years as per normal practice in Mauritius. In addition, Agence Française de Développement will provide low-interest loans to rooftop PV adopters under SSDG Phase 4 to ensure sustained uptake. AFD will also provide concessional finance to enable CEB to further expand and maintain the network in view of a greater proportion of renewables on the grid, in accordance with Government targets. It is important to highlight that CEB will be able to re-invest the savings associated with avoided generation investment (through facilitating the ramp-up of IPP-generated renewable electricity instead of its own generation capacity to meet growing demand) in replacement batteries, since lithium-ion batteries have (predictable) finite lifetimes.

Component 3: PV mini-grid on the outer island of Agalega

97. The staff of the Outer Islands Development Corporation and selected inhabitants of Agalega will undergo the required capacity building in order to be able to maintain the equipment and budget for required maintenance. OIIC is committed to allocating the expected savings from the switch from diesel to PV (US\$ 106,000 per year) to long-term upkeep and expansion of the PV systems.

⁶⁹ This figure includes project management costs but excludes agency fees.

In this section, the accredited entity is expected to provide a brief description of the expected performance of the proposed project/programme against each of the Fund's six investment criteria. Activity-specific sub-criteria and indicative assessment factors, which can be found in the Fund's [Investment Framework](#), should be addressed where relevant and applicable. This section should tie into any request for concessionality made in [section B.2](#).

E.1. Impact Potential

Potential of the project/programme to contribute to the achievement of the Fund's objectives and result areas

E.1.1. Mitigation / adaptation impact potential

98. The project will result in a real and visible paradigm shift in the Republic of Mauritius towards low-carbon sustainable development. The project directly addresses the largest-emitting sector in the country – i.e. energy generation – and implements actions specifically recommended in the Nationally Determined Contribution, the Second National Communication to the UNFCCC and the UNFCCC Technology Needs Assessment.

99. The project is expected to result in direct emission reductions of ~196,000 tCO₂e, broken down by component as follows:

Table 5: Direct and Indirect Emission Reductions to be Achieved by the GCF Project

Component	End-of-Project Emission Reductions (tCO ₂ e)		Source of Emission Reductions
	Direct	Indirect	
Component 1: Institutional strengthening for renewable energy			Complementary to, and supportive of, Component 2 in particular.
Component 2: Improving Grid Absorption Capacity and PV deployment	161,600 (PV deployment) and 33,000 (Smart Grid)	484,800	Grid-connected renewable energy displacing a grid emission factor of 1.01 tCO ₂ /MWh.
Component 3: PV mini-grid on the outer island of Agalega	1,400		PV mini-grid electricity displacing diesel-generated electricity.
Total	196,000	484,800	

100. The project will, in total (direct and indirect emission reductions), reduce ~681,000 tCO₂e by the end of the project and 4.3 million tCO₂e over the lifetimes of the investments enabled by the project. See Annex XIIIg for the detailed emission reduction calculations.

E.1.2. Key impact potential indicator

Provide specific numerical values for the indicators below.

GCF core indicators	Expected tonnes of carbon dioxide equivalent (t CO ₂ eq) to be reduced or avoided (Mitigation only)	Annual	213,350 ⁷⁰
		Lifetime	4,267,000 ⁷¹
	Expected total number of direct and indirect beneficiaries (reduced vulnerability or increased resilience); number of beneficiaries relative to total population (adaptation only)	Total	
		Percentage (%)	

⁷⁰ Annual average of direct and indirect emission reductions.

⁷¹ Direct and indirect emission reductions over the lifetimes of the investments enabled by the project.

Other relevant indicators

- Expected increase in the number of households with access to low-emission energy: 46,500, (of which 21% are female-headed and 45% are low-income)

100. Please refer to Annex XIIIg for detailed greenhouse gas emission reduction calculations.

E.2. Paradigm Shift Potential

Degree to which the proposed activity can catalyze impact beyond a one-off project/programme investment

E.2.1. Potential for scaling up and replication (Provide a numerical multiple and supporting rationale)

Table 6: Scale-Up and Replication Multiples Arising from the GCF Project

Measure	GCF Direct Project Impact	Scale-Up / Replication Multiple
PV	25 MW of high-visibility rooftop PV installations	1.5
Improving Grid Absorption Capacity	25 MW PV installed	4

(i) Rooftop PV

101. The partial grant support provided by the GCF to various categories of consumers will render rooftop solar PV a viable alternative for their energy needs. The highly-visible installations will have a cascading effect in terms of sensitisation and awareness of the population. This impact is difficult to quantify but can conservatively be estimated as a replication multiple of 1.5.⁷²

(ii) Utility-Scale Grid-Connected Renewables

102. See Section E.1.2 above. Once the enabling environment, in the form of improvements to the Grid Absorption Capacity and the creation of the Mauritius Renewable Energy Agency, has been created through GCF intervention, a key barrier to renewable power investment will have been overcome. There is already significant interest from a range of entities, including specialist power firms, industrial co-generators, NGOs and community groups, to establish themselves as grid-connected renewable energy IPPs. CEB estimates that an additional 125 MW of renewable energy generating capacity will be required over the coming 10 years (2015-2025) to meet energy demand and to meet national RE targets, of which 25 MW will be supplied by Phase 4 of the SSDG scheme. The 100 MW of utility-scale RE to be installed indirectly through the conducive environment established by the GCF project represents a replication factor of 4.

E.2.2. Contribution to the creation of an enabling environment

⁷² GEF guidance is to use a default replication factor of 3 for investment projects that incorporate capacity building. Here, a conservative value of 1.5 is proposed.

Describe how proposed measures will create conditions that are conducive to effective and sustained participation of private and public sector actors in low-carbon and/or resilient development.

103. By providing the technical, legal and financial incentives for the promotion of renewable energy, the GCF project will encourage both public and private actors to invest in renewable energy sources. The public sector will be a long-term beneficiary and promoter of renewable energy through the Mauritius Renewable Energy Agency and the Central Electricity Board. The private sector will benefit from the enabling environment created by the *Improving Grid Absorption Capacity* component so as to be able to invest in IPP projects.

Innovation, market development and transformation

104. GCF support to the expansion of the rooftop PV sector in Mauritius will build on a strong baseline project – Phases 1, 2 and 3 of the Small-Scale Distributed Generation (SSDG) scheme – but represents an innovative approach through the use of an upfront partial grant mechanism for households and non-commercial adopters rather than a feed-in tariff. An undifferentiated feed-in tariff approach is considered financially unsustainable and unduly 'locks in' the Government to long-term commitments; moreover, it serves to exclude a large proportion of the (lower-income) population from adopting PV technology. The grant element that will be incorporated into Phase 4 of the GCF-supported SSDG will reduce consumers' acquisition costs and perceived investment risks. GCF-assisted removal of financial, institutional, capacity and information barriers will also contribute to the development of the solar PV market locally, and may open up potential regional export / investment opportunities for Mauritius.

E.2.3. Contribution to regulatory framework and policies

Table 7: Contribution of the GCF Project to Policy and Regulatory Frameworks

Component	Low-Emission Regulatory and Legal Frameworks
Component 1: Institutional strengthening for renewable energy	The Mauritius Renewable Energy Agency, with the status of a parastatal organisation, will be strengthened with GCF support. Appropriate legislation will be drafted to further empower the new institution through appropriate secondary legislation and standards.
Component 2: Improving Grid Absorption Capacity and PV deployment	The Small-Scale Decentralised Generation Programme, an initiative of the Ministry of Energy and Public Utilities and CEB, will be modified and scaled-up with GCF support. It will enable MEPU and CEB to explore new modalities of financing PV and RE systems and create new ownership models.
Component 3: PV mini-grid on the outer island of Agalega	The provision of PV panels and their upkeep over the long-term will require a new regulatory framework and the OI DC Act could also be amended to make provision for an SSDG scheme in Agalega.

E.2.4. Potential for knowledge and learning

Describe how the project/programme contributes to the creation or strengthening of knowledge, collective learning processes, or institutions.

105. UNDP's M&E reporting includes lessons learned as a specific section of evaluation reports. As there will be two interim reports and one final evaluation report, the lessons learned will be included therein and disseminated globally on the UNDP Evaluation Resource Centre (ERC) website.⁷³
106. The project will also make provision for a lessons learned publication highlighting the achievements of the project and documenting lessons learned.
107. Component 1: The Mauritius Renewable Energy Agency will be a new institution that plays a central role in the energy sector. One of MARENA's specific roles will be to contribute to the creation and strengthening of knowledge, particularly for private-sector investors so as to promote the nascent IPP sector. Component 2: CEB staff will be technically equipped to strengthen the national grid to be able to accept larger injections of intermittent renewable electricity. SMEs will receive training to enable them to enter the rooftop PV market. The grid equipment installed will generate considerable volumes of data that will be transmitted to CEB using internet protocols; this data will be analysed to improve understanding of intermittent renewable generation characteristics and consumer electricity usage, and will inform the modification of CEB's grid management strategies.
108. Component 3: OI DC staff and other stakeholders on Agalega, as well as OI DC staff on the mainland, will be trained in the installation, management and maintenance of small-island mini-grid systems.

⁷³ See, for example, <http://erc.undp.org/evaluationadmin/manageevaluation/viewevaluationdetail.html?evalid=6610>.

E.3. Sustainable Development Potential

Wider benefits and priorities

E.3.1. Environmental, social and economic co-benefits, including gender-sensitive development impact

Table 8: Environmental, Social and Economic Co-Benefits of the GCF Project

Co-Benefit	Parameter	Expected Impact of GCF Project	Description
Economic	Number of jobs created	2,000	<p>ILO identifies the energy sector as the most important cross-cutting industry in Mauritius, generating significant inter-industrial linkages that are vital for sustaining growth and economic competitiveness.⁷⁴ Employment opportunities from the GCF project will contribute to the 6.3% of total employment currently considered as constituting 'green jobs'. Project-induced jobs will include those associated with SMEs enabled to enter the rooftop PV market. In total, 2,000 jobs are expected to materialise. Direct jobs will include:</p> <ul style="list-style-type: none"> • Staff of MARENA • People engaged in the import of PV panels • Workers employed in installation of PV panels • Those engaged in the maintenance of the PV panels, including regular cleaning <p>Indirect jobs will include all those ancillary businesses set up to support the above activities, such as provision of spare parts.</p>
Economic	Foreign currency savings	US\$ 550 million	<p>Currently, 16-19% of imports relate to fuel imports, amounting to more than US\$ 1 billion per annum.⁷⁵ Given that the energy sector is a major consumer of fuel, the GCF project will bring about a considerable reduction in fossil fuel over the lifetime of the PV panels, and with the additional renewable energy operators entering the market following the strengthening of the grid and operationalisation of MARENA.</p>
Economic	Reduction in Government budget deficit	US\$ 65 million	<p>The GCF project will offer US\$ 40.91 million of GCF grant resources to Mauritius and will directly unlock US\$ 163.18 million of co-finance.</p>
Social	'Democratisation' of PV	8-20 NGOs to benefit from partial funding for PV systems	<p>The project will, under the GCF-supported Phase 4 of the SSDG scheme, provide incentive support for households, NGOs and the public sector in both Mauritius and Rodrigues. This will enable those who are currently unable to afford rooftop PV systems to be able to install them.</p> <p>Installation of PV mini-grids in the Outer Island of Agalega will enable these islanders, who mostly depend on agriculture and fishing for their living, to obtain access to clean energy and improve their livelihoods through improved energy supply to schools, clinics, refrigeration facilities (for the storage of fish), etc.</p>
Environmental	Improved air quality	Lower emissions of NO _x , SO _x , NMVOCs and	<p>The emission of nitrogen oxides, non-methane volatile organic compounds and sulphur dioxide will decrease from</p>

⁷⁴ ILO (2014), *Green Jobs Assessment: Mauritius*, http://www.ilo.org/global/topics/green-jobs/publications/WCMS_317238/lang--en/index.htm

⁷⁵ <http://statsmauritius.govmu.org/English/StatsbySubj/Pages/External-Trade.aspx>

		CO ₂ from power plants	power production in inverse proportion to the energy generated from renewables.
Gender-sensitive development impact	Social and health impacts and economic participation	New employment opportunities will benefit men and women.	The additional reliable energy supply from the project is expected to improve access to electricity of poor female-headed households in Agalega. While the project is not expected to have other significant direct gender benefits (see the gender assessment in Annex VIe), there will be training and job opportunities that will ensure representation of women. The improved access to clean energy supply is expected to benefit women and female students who are in need of adequate lighting for safety and security, education and for maintaining households. The improved power supply is also expected to create income-generating opportunities that may involve female entrepreneurs and will certainly help home-based micro-enterprises, many of which are run by women.

E.4. Needs of the Recipient

Vulnerability and financing needs of the beneficiary country and population

E.4.1. Vulnerability of country and beneficiary groups (Adaptation only)

Context

109. Owing to the impact of climate change, the Government of Mauritius will face heavy spending on climate change adaptation. While the GCF project is not specifically focused on adaptation, it will nonetheless offer the Government key adaptation benefits in the form of a more stable grid, reduced reliance on energy imports, and a more energy-secure Outer Island population. The project will deliver benefits that are fully aligned with the National Climate Adaptation Framework of Mauritius (2012).⁷⁶ The project is also clearly aligned with the Mauritius NDC and the accompanying Action Plan which requires investments of the order of US\$ 5.2 billion, of which the proposed GCF project is a small contribution. As Mauritius is a SIDS, and located a long distance from the African continental landmass, the costs of adaptation and mitigation are exacerbated.
110. In spite of its small size, low endowment of natural resources and remoteness from world markets, Mauritius has, since its independence in 1968, transformed itself from a low-income, mono-crop based economy into one of the most successful economies in sub-Saharan Africa. This has been possible with political stability and good governance, as well as through fiscal consolidation, trade competitiveness, appropriate regulatory and institutional frameworks, and investment in human capital, amongst others. For most of that period, its 'four-pillar' economy of sugar, textiles, tourism and financial services has experienced annual GDP growth in the order of 5-6%. Today, Mauritius has the second-highest UNDP human development ranking in Africa.⁷⁷
111. Even with solid economic growth, Mauritius is, however, vulnerable to climatic threats, particularly to sea-level rise, reduced rainfall and reduced moisture availability, increased variability and intense rainfall events, and more frequent and more intense cyclones. These vulnerabilities could set back hard-earned development progress in Mauritius.⁷⁸ Given its naturally precarious small-island developing-state situation, Mauritius had long been actively working to address climatic threats. However, many of the projects it has undertaken have been limited in scope and scale and isolated from underlying development, preventing their effects from being widespread, cohesive and sustainable.
112. Institutional capacity to formulate comprehensive adaptation strategies was supported through UNDP's Africa Adaptation Programme (AAP, 2011-2013)⁷⁹ support to the Climate Change Division of the Ministry of

⁷⁶ See Annex XIIIIt.

⁷⁷ <http://ionnews.mu/mauritius-ranks-2nd-africa-human-development-index-2014-0108/>

⁷⁸ UNDESA (2012), *Country Report Paper Application of a Vulnerability Resilience Profile (VRP) to Long-Term, Integrated Sustainable Development Planning*

⁷⁹ <https://www.undp-aap.org/>

Environment and the establishment of working groups in the Ministries of Water, Agriculture, Tourism and Fisheries. Training was conducted on institutional strengthening as well as on the gendered impacts of climate change and the need to mainstream gender in all responses. This engagement resulted in a range of policy adjustments, including to the Capacity Building and Climate Resilient Policies Road Map, the Environment Protection Act, the National Environment Policy, the National Food Security Fund Strategic Plan, and the Master Plan for the Water Sector.⁸⁰ The AAP also established a coordination and implementation framework to ensure the various policies were implemented cohesively and effectively. Cost-benefit analyses undertaken by the AAP also contributed to this objective.

Climate Vulnerability Baseline⁸¹

113. Analysis of temperature data over the period 1950-2007 at several stations in Mauritius and in the Outer Islands shows that the mean temperature is rising by about 0.16 °C per decade. On average, temperatures have increased over the region by 0.74 °C to 1.2 °C since 1950. The warming effect has not been uniform. The minimum temperature has increased by a larger magnitude. Furthermore, summer temperatures have been observed to be increasing more rapidly than winter temperatures, and the number of days with maximum temperatures above the threshold value of 30 °C has risen.
114. Similar warming trends have also been observed on the Outer Islands. St Brandon and Agalega are 1.5 km² and 70 km² in area, respectively, and are 2m above mean sea level at their highest points. The temperature at Agalega is rising at the rate 0.11 °C per decade, with an overall rise of 0.62 °C during the last ten years when compared with the 1961-90 mean. The temperature at St Brandon and Rodrigues has warmed by approximately 1.0 °C.
115. The climate of the South West Indian Ocean small island states is influenced by large ocean-atmosphere interactions, notably the trade winds. Changes in ocean circulation patterns are changing climatic conditions faster than the global average. The SIDS in this region are often affected by tropical cyclones and other extreme weather.⁸² Some of them, such as the Cargados Carajos Shoals and Agalega Islands, are threatened by sea-level rise as well.⁸³ On the basis of reconstructed tide gauge data for the period 1950-2001 and complementary Topex/Poseidon altimeter data, the cumulative sea level rise in the South West Indian Ocean has been 7.8 cm at Port Louis.⁸⁴

Climate Change Activities

116. The impacts of climate change are a major concern to the Republic of Mauritius, including Rodrigues, St Brandon and Agalega. A key vulnerability is the energy system. Mauritius relies (approximately 84%) on fossil fuel imports for its energy needs. Extreme weather events, such as higher-intensity tropical cyclones, disrupt supply chains for fuel delivery, and may also damage or destroy key parts of the above-ground electricity transmission and distribution systems. All three elements of the GCF project address fossil fuel dependency: greater locally-generated renewable energy increases resilience to climate change. This is true of each component, but particularly so for Component 3, PV installations on Agalega, which, when major storms interrupt supply, is left without power. Enabling and developing distributed renewable energy generation sources (Components 1, 2 and 3) reduces transmission and distribution losses and also will facilitate more rapid recovery from transmission system failures resulting from extreme events. In particular, at least some electricity supply will be available for some essential uses immediately after such a transmission system interruption, albeit on a fragmented grid. This will substantially improve resilience through the ability to immediately direct power to hospitals, emergency centres and other essential services.

Beneficiary Groups

117. The GCF project targets less affluent Mauritians, but the entire population will benefit. By increasing the use of local renewable energy and reducing the reliance on imported fossil fuels, Mauritius will benefit economically and will be less vulnerable to economic shocks from price fluctuations, as well as benefiting from fewer supply

⁸⁰ <https://www.undp-aap.org/countries/mauritius>

⁸¹ <http://metSERVICE.intnet.mu/climate-services/climate-change.php>

⁸² <http://metSERVICE.intnet.mu/publications/list-of-historical-cyclones.php>

⁸³ UNEP (2006), *Africa Environment Outlook 2*, <http://www.unep.org/dewa/Africa/publications/AEO-2/content/090.htm>

⁸⁴ Second National Communication to UNFCCC (2010).

chain interruptions due to climate change-induced extreme weather events. At a higher level, policy-makers will benefit from an enhanced policy context as well as an understanding of climate relatedness of specific policy actions to better incorporate the issues connected with climate change mitigation into long-term planning in the energy sector.

(i) Electricity Producers

118. All Mauritians will stand to benefit from the project since the facilitation of renewable energy uptake (Components 1 and 2) and the installation of PV facilities will be democratized through SSDG Phase 4 to be supported under the project. Those who do not benefit directly from the project (that is, those who do not have rooftop PV) will nonetheless benefit from increased grid stability, lower grid losses and more stable electricity prices over time. With a higher renewable energy content distributed throughout the grid, all Mauritians will benefit from more rapid re-establishment of supply after climate-forced interruptions.

(ii) Electricity Consumers

119. In the current circumstances, electricity consumers are vulnerable to imminent shortages in electricity production, as detailed in a recent World Bank report.⁸⁵ Electricity consumers are also vulnerable to damage to the national grid resulting from extreme weather events. Rooftop PV will provide them with an energy source when the grid is unavailable and thus contribute to improving the resilience of electricity production nationally.

120. Similarly, residents of Agalega are vulnerable to lack of supply of diesel oil in the event of persistent bad weather or lack of transportation. By providing them with a domestic source of electricity and by equipping them with the necessary skills, OI DC will be empowered to improve the lives of the highly vulnerable small population. Residents of Agalega will therefore particularly benefit through reduction in their electricity supply vulnerability (since diesel deliveries will not be required beyond back-up), and through increased resilience by enabling local management of their energy supply.

E.4.2. Financial, economic, social and institutional needs

121. The need for GCF grant funding is partly explained by the evolution of, and policy on, the public debt of the Government of Mauritius. The public sector debt-to-GDP ratio (international definition) increased from 60.1% percent in 2013 to 61.5 percent in 2014.⁸⁶ Net public debt was 54.2% in 2015. Despite this difficult situation, the Government remains committed to bringing public sector debt down to 50% in 2018, as it is legally required to do under the 2008 Public Debt Management Act.⁸⁷ However, the fiscal deficit is likely to remain high (3.4%)⁸⁸ due to lower than expected economic growth reducing public revenues. According to a recent IMF report (Annex XIIIa), the Government's statutory debt ceiling as per the Public Debt Management Act will not be met. The report recommends that debt should be reduced to limit the vulnerability of the country. In addition, some worst-case scenarios have now materialized: for example, revision of the Double Taxation Agreement (mentioned in the report as a risk with a low probability of materializing but high impact) and 'Brexit' accompanied by US\$ appreciation. As the IMF notes (paragraph 32):

“Despite improved fiscal conditions in 2015, containing the primary deficit under 1 percent of GDP may not be enough to achieve the statutory debt target. Under this scenario, the debt target would be missed by some 4 percentage points of GDP. Reaching the 2018/19 statutory debt target would require a more pronounced and frontloaded adjustment. This would involve a further decline in the primary deficit in 2016/17 (to 0.3 percent of GDP, 1/2 percent of GDP lower than the baseline), and gradually improving in subsequent years to reach a small primary surplus (0.3 percent of GDP) by 2018–19. While the order of magnitude of the additional adjustment involved is feasible, it is important to frame it within a quantified medium-term debt reduction plan consistent with preserving growth.”

⁸⁵ World Bank (2015), *Assessment of Electricity Demand Forecast and Generation Expansion Plan with a focus on the 2015–2017 Period* – Annex XIIIaa.

⁸⁶ Reported in the National Budget 2015.

⁸⁷ <http://mof.govmu.org/English/Legislation/Documents/PubDebtManagementAct.pdf>

⁸⁸ <http://www.investmauritius.com/budget2015/Economic.aspx>

122. The institutional needs of the project's key stakeholders, and the incremental logic of GCF support, are outlined in Sections C.1, C.2, C.3, D.1 and F.1.

E.5. Country Ownership

Beneficiary country (ies) ownership of, and capacity to implement, a funded project or programme

E.5.1. Existence of a national climate strategy and coherence with existing plans and policies, including NAMAs, NAPAs and NAPs

123. The project is fully aligned with key Government policies and strategies.

124. The *Second National Communication to the UNFCCC* (2010)⁸⁹ notes that Mauritius's overall greenhouse gas (GHG) emissions are growing by 2.7% per year, and those from the energy sector specifically by 5.4% per year. The energy sector accounts for two-thirds of Mauritius's total greenhouse gas (GHG) emissions of 3.8 MtCO_{2e}.

125. As identified by the country's *UNFCCC Technology Needs Assessment* (2012)⁹⁰, solar energy, energy efficiency and energy conservation offer significant potential. The TNA developed methodologies, tools and capacity building for prioritising sectoral technologies, undertaking detailed barrier analysis, and undertaking detailed socio-economic analysis of mitigation technologies; it also developed concept notes for leveraging climate finance to support technology transfer and diffusion. A Cabinet Decision on 16 August 2013⁹¹ took note of the recommendations in the TNA report, including recommendation (f): 'promotion of the use of renewable energy, reduction of fuel importation and promotion of greenhouse emissions reductions'.

126. The GCF proposal is fully aligned with the *Nationally Determined Contribution (NDC) Action Plan*, which was approved by the Cabinet in March 2016 and which clearly references the GCF project.⁹² The NDC explicitly reiterates the 35% renewable energy target by 2025 and indicates the need to modernise the national electricity grid through the use of smart-grid technologies. Furthermore, the catalytic role of the GCF is made clear in the NDC (page 4): "Mauritius is working towards mitigating its emissions and implementing adaptation actions. However, the proposed adaptation and mitigation activities can only be implemented in the medium and long term with necessary support from international funding agencies, grants from climate funds, transfer of appropriate and affordable adaptation and mitigation technologies, technical assistance and capacity development."

127. The Government's drive to reduce fossil fuel use is reflected in the *Long-Term Energy Strategy 2009-2025*⁹³. Under this Strategy, the Government has recently announced two key targets:

- A renewable energy (RE) target of at least 35% of electricity production by 2025.
- The establishment of a dedicated Mauritius Renewable Energy Agency to coordinate the rapid intake of renewable energy.

128. Since 2011, the *Sustainable Mauritius (Maurice Ile Durable)* concept⁹⁴ has provided a long-term vision for promoting sustainable development in Mauritius. The concept covers five areas, namely Energy, Environment, Equity, Education and Economy/Employment. Objectives include: "To increase the resilience of our nation to unpredictable and shifting external factors such as climate change or global crises" and to "promote a climate-resilient development pathway and pursue climate change adaptation and mitigation programmes".⁹⁵

129. The GCF project will be implemented by the relevant line Ministries as well as the Central Electricity Board under the guidance of the Project Board. Refer to Section E.5.3 for details of the consultation process and the support

⁸⁹ <http://unfccc.int/resource/docs/natc/musnc2.pdf>

⁹⁰ http://unfccc.int/tclear/templates/render_cms_page?TNR_cre

⁹¹ <http://pmo.govmu.org/English/Documents/Cabinet%20Decisions%202013/Cabdec16August2013.pdf>

⁹² The NDC is provided in Annex XIIIab.

⁹³ <https://sustainabledevelopment.un.org/content/documents/1245mauritiusEnergy%20Strategy.pdf>

⁹⁴ <http://business.mega.mu/2011/04/19/cabinet-approved-maurice-ile-durable-mid-project/>

⁹⁵ <http://mid.govmu.org/portal/sites/mid/index.html>

from the various institutions. A large number of domestic stakeholders will also be involved in the project. In line with the Government's policy to better involve youth⁹⁶ and civil society organisations⁹⁷ in national initiatives, the project will adopt a socially-inclusive approach and the adoption of 25 MW of rooftop PV panels under the SSDG scheme will be targeted at these groups. The project is also aligned with the Government's National Gender Policy Framework.⁹⁸

E.5.2. Capacity of accredited entities and executing entities to deliver

130. Please refer to Section C.4 for information about the Executing Entity and Responsible Parties.

131. UNDP has maintained a Country Office in Mauritius since 1974. The Environment & Climate Change Unit is the largest within the Country Office, employing 9 staff and managing a US\$ 22 million portfolio. UNDP has excellent high-level and operational-level relations with Government counterparts and assisted the Government in developing the National Climate Change Adaptation Framework in 2013. The GCF project draws directly from UNDP experience managing a Global Environment Facility (GEF) project, 'Removal of Barriers to Solar PV Power Generation in Mauritius, Rodrigues and the Outer Islands' project⁹⁹ (2011-16) and from support provided to the Outer Island of Agalega through the same project; and indirectly from the GEF-financed 'Removal of Barriers to Energy Efficiency and Energy Conservation in Buildings' project¹⁰⁰ (2008-14), the SIDS-DOCK-financed 'Energy Efficiency and Renewable Energy in Mauritius' project (2012-16)¹⁰¹, and support to the Ministry of Environment and Sustainable Development in developing climate finance expertise¹⁰². The Country Office is backstopped by the UNDP Regional Service Centre in Addis Ababa, which houses 4 climate change and 4 energy technical advisors.

E.5.3. Engagement with civil society organizations and other relevant stakeholders

132. The GCF project has been developed through close consultations with the GCF Secretariat. The proposal is now accompanied by over 90 annexes and is in line with the request emanating from the National Designated Authority on behalf of the participating Ministries.

133. The Ministry of Finance and Economic Development (MOFED), Ministry of Energy & Public Utilities (MEPU), the Central Electricity Board (CEB) and the Ministry of Ocean Economy (MOE) have all been thoroughly involved in the design of the relevant components of the GCF project. The project has been developed through a joint effort of the following stakeholders:

- Ministry of Finance and Economic Development
- Ministry of Energy and Public Utilities
- Central Electricity Board
- Ministry of Environment, Sustainable Development, Disaster and Beach Management
- Agence Francaise de Développement (AFD)
- United Nations Development Programme (Country Office and Corporate)

134. Within the Ministry of Finance and Economic Development, which is also the National Designated Authority (NDA), the Sector Management teams for Energy as well as the Development Cooperation section provided inputs into the funding proposal.

135. Within the Ministry of Energy and Public Utilities, the project was approved by the Technical Department and the Senior Chief Executive.

⁹⁶ <http://pmo.govmu.org/English/Documents/Reports%202015/Govt%20prog%202015.pdf>

⁹⁷ See the Ministry of Social Security website: <http://socialsecurity.govmu.org/English/Department/Pages/Non-State-Actor-Unit.aspx>

⁹⁸ http://gender.govmu.org/English/Documents/activities/nat_gen_pol_fr_mts.doc

⁹⁹ https://www.thegef.org/gef/project_detail?projID=4099

¹⁰⁰ https://www.thegef.org/gef/project_detail?projID=2241

¹⁰¹ <http://sidsdock.org/financial-resources>

¹⁰² UNDP-UNEP CDM Capacity Development Project (2008-2013),

http://www.undp.org/content/undp/en/home/ourwork/environmentandenergy/strategic_themes/climate_change/carbon_finance/CDM/mauritius_opportunities.html

136. The Ministry of Environment, Sustainable Development, Disaster and Beach Management, which is also the UNFCCC Focal Point, was consulted in detail. The UNFCCC Focal Point for Mauritius has provided a letter of support to the GCF project – see Annex Ib.
137. As a co-financing partner, Agence Francaise de Développement (AfD) was formally consulted on 11 June 2015 and at frequent intervals thereafter. UNDP and AFD have a cooperation MoU in place (Annex XIIIh).
138. A stakeholder consultation meeting, open to all interested parties, was held to discuss the GCF project and finalise its design elements. A Project Appraisal Committee (PAC) meeting was held on 16 July 2015 with 18 institutions spanning Government, the private sector, NGOs, academia and regional organisations (see Annex VIIa).
139. The Letter of No Objection was signed by the NDA on 30 July 2015 and reissued on 20 October 2016 (Annex Ia).
140. The Government and UNDP have also invested considerable time and effort in ensuring consultations during preparation of responses to the GCF Secretariat review process. The UNDP global mitigation GCF coordinator effected visits to Mauritius in August 2015 and February 2016, and held consultations with key stakeholders, including: the National Designated Authority, the Ministry of Energy and Public Utilities, CEB, AFD and the INDC consultants working for the Ministry of Environment, Sustainable Development, Disaster and Beach Management. Specialist consultants have been hired to work on technical aspects of the proposal: the financial and economic analysis; the social and environmental risk identification and management plan; engineering and technical due diligence; and the gender assessment.

E.6. Efficiency and Effectiveness

Economic and, if appropriate, financial soundness of the project/programme

E.6.1. Cost-effectiveness and efficiency

Describe how the financial structure is adequate and reasonable in order to achieve the proposal's objectives, including addressing existing bottlenecks and/or barriers; providing the least concessionality; and without crowding out private and other public investment.

141. Component 1 (support to MARENA) and Component 3 (Agalega PV) are not revenue-generating in any meaningful sense. Component 2 (rooftop PV) has revenue-generation aspects but is not driven by a commercial logic: the GCF support to rooftop PV is designed to ensure that lower-income stakeholders can benefit from this technology. The drive is not to “make money”.
142. Moreover, it is important to bear in mind that the GCF grants will be augmented by considerable loans provided as co-finance by AFD. Therefore, the project is proposing a package for investors consisting of a mix of grants, AFD loans and investors’ own resources. This mixture enables the project to mobilise more resources, over and above GCF funding, and hence scale-up the project to bring about the transformational change to energy systems being sought by the GCF.
143. Detailed financial and economic analyses have been conducted for Component 2 (separate analyses for the Improving Grid Absorption Capacity and SSDG Phase 4 elements), and Component 3. Component 1 involves the establishment and operationalisation of the Mauritius Renewable Energy Agency, and is structured to be an institutional capacity building component; consequently, financial and economic analysis is not considered pertinent for this Component at this stage. In the analyses carried out, all capital costs are deemed to be inclusive of project management costs. Financial Internal Rate of Return (FIRR) and Economic Internal Rate of Return (EIRR) values have been computed for Component 2 (both elements), and detailed inputs, assumptions and methodologies of these calculations are described in Annex XII.
144. Based on the financial structure and levels of GCF concessionality being requested, FIRR values for Components 2 (both elements) and 4 are higher than the hurdle rate (the weighted average cost of capital – WACC), with

positive Financial Net Present Values (FNPVs). While computing the hurdle rate (WACC), suitable values for alternative returns on equity from the perspective of each Component's executing entity have been considered, along with the cost of debt and the Component's financing structure. Sensitivity analyses of the project's FIRR against key input and assumption values have also been conducted for Components 2 (both elements) and 4, to assess the robustness of the Components' financial returns against unexpected changes to their input variables. For Component 2 (Improving Grid Absorption Capacity element), FIRR values are lower than hurdle rates if the feed-in tariff to be paid by CEB or if interest rates on the debt portion of the Component's financing structure increase. On the other hand, for the SSDG Phase 4 element of Component 2, FIRR values are lower than hurdle rates if feed-in tariffs to be received by project developers from CEB decrease or if interest rates on the debt portion of their financing structure increase. Hence, any increase or reduction in the feed-in tariff for solar projects needs to be carefully weighed by the Government to ensure financial returns to CEB for its improving Grid Absorption Capacity investment and financial returns to project developers for their solar PV investments remain attractive.

145. As described in Section D.1, the FIRR values of Component 2 (both elements) are lower than their hurdle rates (negative NPV and hence financially unviable or not attractive) if the GCF grants are lower than those proposed.
146. As outlined in the letter of support from the international energy consultancy firm, Grue & Hornstrup (Annex XIIIap), grid strengthening is increasingly required on electricity grids for voltage and frequency regulation in the context of intermittent renewable energy. Such strengthening is in the early stages of take-up, even in developed countries, and there is a strong rationale for the GCF to support early-stage adoption in developing countries. SIDS such as Mauritius tend to have the greatest need for grid strengthening due to their need to reduce fossil fuel consumption (for energy security and balance of payments reasons) while also having small and isolated – and therefore potentially unstable – grids. In the case of Mauritius, it should be noted that there is currently a pipeline of over 39 MW of Independent Power Producer (IPP) solar PV and wind generation that is legally, technically and financially clear to proceed but which is stalled simply because the grid is currently unable to absorb this volume of intermittent renewable energy. The introduction of the grid strengthening will unlock this private sector investment: for a modest GCF investment of US\$ 11m, private investment of US\$ 70m will be directly enabled. The grid strengthening is not 'revenue-generating' for the grid operator, CEB. It is, rather, better characterized as a 'public good': the grid strengthening will enable large-scale investment in renewable energy, but the proceeds from this investment will flow to IPPs, not to CEB. As a non-profit-making parastatal entity operating with socially-oriented electricity tariffs set externally (by the Government), CEB will be required to invest in grid strengthening with no opportunity for cost recovery. CEB's investment budget is typically limited to approximately US\$ 135m per year, and it already faces significant medium-term costs – amounting to US\$ 514m – for unrelated investments. Nonetheless, CEB has indicated that, should GCF support be forthcoming, it will specifically seek co-finance in order to implement the necessary grid strengthening measures.
147. For Component 3, revenues cover only 5% of the ongoing operating costs and the remaining 95% of operating costs will be covered by Government grants to OIIC. Given the public good nature of this Component, serving a remote and vulnerable community, the concessionality offered by a GCF grant to completely cover the capital costs of the three PV mini-grid installations is critical.
148. The proposed financing structure and GCF concessionality being requested for each of the components have been arrived at after careful consideration of other financing options, including debt and private sector financing. For example, in Component 2 (Improving Grid Absorption Capacity element), the GCF grants being requested amount only to 38.5% of the overall capital costs, with the remainder being financed by a loan from AFD. Similarly, the financing structures of Component 2 (25 MW solar PV under SSDG Phase 4).
149. Based on the proposed financial structure and levels of GCF concessionality being requested, EIRR values for Components 2 (both elements) and 3 are higher than the hurdle rate (a discount rate of 10% is considered as the hurdle rate) with positive Economic Net Present Values (ENPVs). Sensitivity analyses of the project's EIRR against a 20% increase in estimated costs and a 20% reduction in estimated economic benefits have also been conducted for Components 2 (both elements) and 3, to assess the robustness of the Components' economic returns against unexpected changes to their input variables. EIRR values under sensitivity analyses for

Component 2 (25 MW PV element) are still above the discount rate of 10%. For Component 2 (Improving Grid Absorption Capacity element), EIRR values are still higher than the hurdle rate even if investment costs increase by 20%, but EIRR values drop below the discount rate if estimated economic benefits are reduced by 20%. EIRR values under sensitivity analysis for Component 3 (Agalega mini-grid) are negative if investment costs increase by 20% or estimated economic benefits decrease by 20%.

150. EIRR values of Component 2 (Improving Grid Absorption Capacity element), and Component 3 are lower than their hurdle rates (negative ENPV and hence economically unviable) if the GCF grants are lower than those proposed. However, the EIRR for Component 2 (PV element) is still higher than the hurdle rate without GCF grants, even though the FIRR value is lower than the hurdle rate without the GCF grant for this Component.

Please describe the efficiency and effectiveness, taking into account the total project financing and the mitigation/adaptation impact that the project/programme aims to achieve, and explain how this compares to an appropriate benchmark. For mitigation, please make a reference to [E.6.5 \(core indicator for the cost per tCO₂e\)](#).

151. The project is considered to be highly cost-effective, generating 4.27 million tCO₂e of direct and indirect emission reductions over the lifetimes of project investments at a cost to the GCF of US\$ 6.6/tCO₂e.

E.6.2. Co-financing, leveraging and mobilized long-term investments (mitigation only)

Please provide the co-financing ratio (total amount of co-financing divided by the Fund's investment in the project/programme) and/or the potential to catalyze indirect/long-term low emission investment.

152. Co-financing details are provided in Table 2, Section B.1.

153. The co-financing ratio of the entire project is 5.8. If further investments in renewable energy as a result of Improving Grid Absorption Capacity are taken into account, then the co-financing ratio, including leveraged funds from private investors for another 100 MW on the grid, is 14.

E.6.3. Financial viability

Please specify the expected economic and financial rate of return with and without the Fund's support, based on the analysis conducted in F.1.

154. The expected financial and economic internal rates of return (FIRR and EIRR) for Components 2 (both elements) and 4 with GCF grants and without GCF grants are shown in Table 9 below.

Table 9: GCF Project FIRRs and EIRRs

Project Component	FIRR (with GCF Grants)	FIRR (without GCF grants)	EIRR (with GCF grants)	EIRR (without GCF grants)
Component 2 (CEB Improving Grid Absorption Capacity)	7.13% (hurdle rate 6.55%)	5.14% (hurdle rate 6.34%)	11.3% (hurdle rate 10%)	9.3% (hurdle rate 10%)
Component 2 (25 MW grid-connected solar PV)	7.67% (hurdle rate 7.24%)	4.58% (hurdle rate 7.99%)	27.7% (hurdle rate 10%)	18.3% (hurdle rate 10%)
Component 3 (Agalega mini-grids)	N/A	N/A	23.9% (hurdle rate 10%)	-9.4% (hurdle rate 10%)

154. Please note that, in the absence of guidance from the GCF on the selection of a specific economic discount rate to use in the economic analysis, all proposals supported by UNDP have opted to use a 10% discount rate, in line with the existing practice of multilateral development banks. Should the GCF request that all proposals submitted for review use the same discount rate and that this rate be other than 10%, we will be happy to revise the economic analysis accordingly.

Please describe financial viability in the long run beyond the Fund intervention.

155. Under Component 1, MARENA will be embedded in law and will receive an annual budget from Government. Therefore, unlike a departmental unit which exists only administratively in Government, MARENA is bound to have a long-term future with a specific, if not growing, mandate. The support to the deployment of PV following the improvement of Grid Absorption Capacity, as described in Component 2, will be a long-term feature beyond the project duration of 8 years because IPPs under the SSDG sign 15-year power purchase agreements with CEB. Moreover, as CEB has committed to allowing a greater proportion of intermittent RE on the grid, enabled by the improvement of Grid Absorption Capacity, the presence of intermittent RE will require regular and timely investment in BESS. As for Agalega, contrary to Mauritius, the electrification was carried out by a Government electrical maintenance department, with limited expertise in PV. In the context of the GCF project, CEB will be fully involved and will, therefore, be able to provide the required expertise and human resources. In addition, OI DC has committed to investing the savings incurred through the project in the establishment of a technical maintenance team.

E.6.4. Application of best practices

156. Component 1: The promotion of renewable energy should, in principle, be carried out by a dedicated and specialised team, instead of being spread over a number of organisations. MARENA will act as a 'one-stop shop' for private sector energy investors, providing a single point of interaction with the Government to obtain information and data, complete necessary paperwork and schedule meetings with relevant parties (such as CEB). This is considered international best practice.¹⁰³

157. Component 2: Improving Grid Absorption Capacity will be carried out in accordance with best practice. CEB has a long-established working relationship with Electricité de France, which has considerable experience with grid stabilisation technology. In addition, the procurement of equipment will be carried out through international, competitive tendering processes, thereby guaranteeing CEB with the best available technology at the best value. The rooftop PV installations under the GCF-supported Phase 4 of the SSDG will require that the new installations comply with the Mauritius Grid Code, which is based on international standards. A copy of the Grid Code and an assessment of its conformity with international best practice are provided in Annex XIII (XIIIa, XIIIb, XIIIc and XIId).

158. Component 3: The implementation of the Agalega PV component in Phase 2 will enable OI DC to benefit from the experience with PV installations and SMEs trained in Phase 1. Competitive tenders will be launched for the supply, installation and commissioning of the three villages' PV systems, as well as training of the local technicians. Warrantees will also be sought in order to ensure an after-sales service for the expected lifetime of the equipment.

E.6.5. Key efficiency and effectiveness indicators

<i>GCF core indicators</i>	Estimated cost per t CO ₂ eq, defined as total investment cost / expected lifetime emission reductions (mitigation only)
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¹⁰³ See, for example, Community Power Agency (2014), *Government Support Options for Community Energy: Best Practice International Policy*. http://cpagency.org.au/wp-content/uploads/2015/01/CPA_Best-Practice-International-Policy_Oct-2014.pdf

(a) Total project financing	US\$ 191. million
(b) Requested GCF amount	US\$ 28.21 million
(c) Expected lifetime emission reductions over time	4.27 million tCO ₂ eq
(d) Estimated cost per tCO₂eq (d = a / c)	US\$ 44.82 / tCO₂eq
(e) Estimated GCF cost per tCO₂eq removed (e = b / c)	US\$ 6.6 / tCO₂eq

Describe the detailed methodology used for calculating the indicators (d) and (e) above.

159. The project budget is presented in Table 2, Section B.1.

160. The GHG emission reductions are presented in Annex XIIIg.

Please describe how the indicator values compare to the appropriate benchmarks established in a comparable context.

161. The project is considered to be highly cost-effective, providing 4.27 million tCO₂e of emission reductions at a cost to the GCF of US\$ 6.6/tCO₂e. This is considerably lower than the social cost of carbon estimated by the US Environmental Protection Agency.¹⁰⁴

Expected volume of finance to be leveraged by the proposed project/programme and as a result of the Fund's financing, disaggregated by public and private sources (mitigation only)

Table 10: Co-Finance in Phase 1 of the GCF Project (2017-2019)

Component	GCF Grant Contribution (US\$ millions) ¹⁰⁵	Co-Finance Contribution: Public Sector (US\$ millions) ¹⁰⁶	Co-Finance Contribution: Private Sector (US\$ millions)	Total Co-Finance (US\$ millions)
Component 1: Institutional strengthening for renewable energy	1.1	1.08		1.08
Component 2: Improving Grid Absorption Capacity and PV deployment	10.9	20		20
TOTAL	12	21.08		21.08

Table 11: Co-Finance in Phase 2 of the GCF Project (2020-2024)

Component	GCF Grant Contribution (US\$ millions)	Co-Finance Contribution: Public Sector (US\$ millions)	Co-Finance Contribution: Private Sector (US\$ millions)	Total Co-Finance (US\$ millions)
Component 2: Improving Grid	15.4	140.9		140.9

¹⁰⁴ Mid-range estimate is US\$ 25: <http://www.epa.gov/climatechange/EPAactivities/economics/scc.html>

¹⁰⁵ Figures are inclusive of project management costs and agency fees.

¹⁰⁶ Public sector includes co-finance from Government, CEB, UNDP and AFD. Private sector includes co-finance from households and NGOs.



Absorption Capacity and PV deployment				
Component 3: PV mini-grids on the Outer Island of Agalega	0.81	1.2		1.2
TOTAL	16.21	142.1		142.1

Table 12: Co-Finance in Phases 1 and 2 of the GCF Project (2017-2024)

Component	GCF Grant Contribution (US\$ millions)	Co-Finance Contribution: Public Sector (US\$ millions)	Co-Finance Contribution: Private Sector (US\$ millions)	Total Co-Finance (US\$ millions)
Component 1: Institutional strengthening for renewable energy	1.1	1.08		1.08
Component 2: Improving Grid Absorption Capacity and PV deployment	26.3	160.9		160.9
Component 3: PV mini-grids on the Outer Island of Agalega	0.81	1.2		1.2
TOTAL	28.21	163.18		163.18

Table 13: Leveraged Finance Arising from the GCF Project¹⁰⁷

Component	Leveraged Finance				Total Leveraged-Finance (US\$ millions)
	Source Public Sector	Amount Million (US\$)	Source Private Sector	Amount Million (US\$)	
Component 1: Institutional strengthening for renewable energy	Government (through annual budget of MARENA)	2			2
Component 2: Improving Grid Absorption Capacity and PV deployment	CEB (replacement of grid batteries over 10 years)	41.5	Households and other entities (25 MW)	30.5	322
			Utility-scale IPPs (100 MW additional)	250	

Other relevant indicators (e.g. estimated cost per co-benefit generated as a result of the project/programme)

Table 14: GCF Cost of Co-Benefits

¹⁰⁷ Leveraged finance is defined here as being investment that is enabled by the GCF project and is catalysed by the project, but which is not under the direct influence of the project.

Co-Benefit	Parameter	Expected Impact of GCF Project	GCF Cost Per Co-Benefit
Economic	Number of jobs created	2,000	GCF US\$ 14,000 per green job created
Economic	Foreign currency savings	US\$ 550 million	US\$ 19.5 of foreign currency savings per GCF US\$
Economic	Reduction in Government budget deficit	US\$ 65 million	US\$ 2.3 reduction in Government budget deficit per GCF US\$
Social	'Democratisation' of PV	8-20 NGOs to benefit from partial funding for PV systems	GCF US\$ 11,459 per stakeholder adopting PV

* The information can be drawn from the project/programme appraisal document.

F.1. Economic and Financial Analysis

Please provide the narrative and rationale for the detailed economic and financial analysis (including the financial model, taking into consideration the information provided in [section E.6.3](#)).

Component 2 (Improving Grid Absorption Capacity Element)

162. The financial analysis methodology for Component 2 (Improving Grid Absorption Capacity element) involves cash flow projections for costs and revenues to CEB from sale of electricity procured from potential renewable energy installations that can supply intermittent electricity to a newly-strengthened national grid owned and operated by CEB. The resultant FIRR is compared with the WACC (hurdle rate). The key input values and assumptions used in this analysis are explained in detail in Annex XII.
163. The Improvement in Grid Absorption Capacity element of Component 2 generates economic benefits in several ways. The most important is in the form of incremental cost savings due to the reduced need to import fossil fuel for generating electricity, equivalent to the amount of electricity expected to be generated by the potential new grid-scale solar power projects that can now be integrated into the grid with enhanced capacity. Given that wind power projects have lower potential than solar PV in Mauritius, and the challenges associated with installing wind power projects in the country, for simplicity reasons fossil fuel savings only from potential solar PV installations are considered.
164. In addition, it is well-known worldwide that renewable energy projects provide an incremental addition to the host country's GDP, by generating direct and indirect jobs. An IRENA report¹⁰⁸ cites a study on the impact of addition of grid-connected solar PV projects to Mexico's GDP, wherein addition of 20,000 MW of solar PV capacity was estimated to add between \$7.9 billion and \$28.5 billion to the country's economy, depending on whether or not local manufacturing of solar panels was involved. Due to the lack of a similar study for Mauritius, these estimated values for Mexico are used in the current analysis, with the chosen value being the most conservative - US\$ 3.95 billion (50% of low-end value for Mexico) per 20,000 MW or US\$ 0.2 million per MW.
165. Economic costs computed at constant 2015 prices include: (i) capital costs for funding Improving Grid Absorption Capacity and (ii) operational costs incurred by CEB. Costs have been budgeted at constant prices; no transfer payments and contingencies are considered. A shadow conversion factor (SCF, the inverse of the shadow exchange rate factor or SERF) of 0.95 has been considered for tradable goods in Mauritius for conversion from financial to economic prices.¹⁰⁹ A shadow wage rate factor (SWRF) has not been considered. Transfer payments and physical contingencies are excluded from the economic analysis. More detailed inputs and assumptions are provided in Annex XII.

Component 2 (25 MW Solar PV)

166. The total 25 MW of grid-connected PV capacity will be developed by non-CEB entities: households, NGOs and public buildings. The financial analysis methodology involves cash flow projections for project costs and revenues to the project development entities from sale of electricity generated by their solar power installations (totalling 25 MW) to CEB. The resultant FIRR is compared with the WACC (hurdle rate). The key input values and assumptions used in this analysis are provided in Annex XII.
167. This element of Component 2 generates economic benefits in a similar manner to the improvement of Grid Absorption Capacity element – incremental cost savings due to the reduced need to import fossil fuel for generating electricity and incremental additions to the country's GDP, by generating direct and indirect jobs. Estimation of both these benefits follows the same methodology as that for the improvement of Grid Absorption Capacity element of this Component.

¹⁰⁸ IRENA (2014), *Socio-Economic Benefits of Solar and Wind Energy*.

<http://www.irena.org/menu/index.aspx?mnu=Subcat&PriMenuID=36&CatID=141&SubcatID=418>

¹⁰⁹ As per the Ministry of Finance and Economic Development's guidelines for physical assets, there is no need to consider a SERF. However, in reality, a SERF is not exactly the same as the official exchange rate. Hence, a small deviation is considered.

168. Economic costs computed at constant 2015 prices include: (i) capital costs for funding solar PV installations, and (ii) operational costs that include the installed capacity's routine operations and maintenance (O&M) costs. Costs have been budgeted at constant prices; no transfer payments and contingencies are considered. More detailed inputs and assumptions are provided in Annex XII.

169. Tariff-related risks associated with this element of Component 2 are considered low. The power purchase agreements (PPAs) for Small-Scale Distributed Generators specify fixed tariffs for 15 years, thereby eliminating the risks for small producers.

Component 3 (Agalega Mini-Grid Solar PV)

170. This Component involves installing solar PV-based mini-grid hybrid systems (300 kW in total), using existing diesel generators acting as back-up, to provide reliable and affordable electricity to 70 households (~300 inhabitants) and public buildings spread over 3 settlements on Agalega's North and South Islands. Given that the project is intended to provide access to energy to a small, rural population in the outer islands, it is not expected to generate significant financial benefits due to the small monthly fees collected by OIDC from these households for providing electricity. Hence, computing a WACC and FIRR is not pertinent for this Component. However, assessment is conducted to explore the extent to which the monthly fees collected from households covers the project's operational costs. Based on detailed inputs and assumptions provided in Annex XII, the fees collected by OIDC from households cover about 5% of the ongoing operational costs of the mini-grid systems. The residual 95% of operating costs will be covered by Government grants to OIDC.

171. This Component's primary economic benefit is the incremental avoided cost of diesel due to the replacement of a large fraction (~80%) of existing diesel generator-based power generation capacity by solar power. However, it is well documented that the availability of reliable, clean and affordable electricity to rural households provides a number of additional welfare benefits, such as increases in productivity of home-based businesses, time saved for household chores or leisure, educational benefits to children and the general economic value of access to reliable and high quality lighting and television viewing experiences. These welfare benefits were quantified for a few countries in a 2008 World Bank report.¹¹⁰ However, this report does not quantify the benefits for Mauritius. Hence, quantified benefit values for the most comparable country, Philippines, are used. Both Mauritius and Philippines are archipelagic countries with similar challenges associated with providing energy access in remote islands.

172. Economic costs computed at constant 2015 prices¹¹¹ include: (i) capital costs for funding the solar PV mini-grid system, and (ii) operational costs that include the installed capacity's routine operations and maintenance (O&M) costs and the small cost of diesel that will continue to be used in the back-up generators. Costs have been budgeted at constant prices; no transfer payments and contingencies are considered. More detailed inputs and assumptions are provided in Annex XII.

Based on the above analysis, please provide economic and financial justification (both qualitative and quantitative) for the concessionality that GCF provides, with a reference to the financial structure proposed in section B.2.

173. Based on the financial and economic analysis described above, and on the basis of the proposed financial structure and levels of GCF concessionality being requested, FIRR values for Components 2 (both elements) and 4 are higher than the hurdle rate (where the WACC is considered to be the hurdle rate), with positive Financial Net Present Values (FNPVs). EIRR values for Components 2 (both elements) and 3 are higher than the hurdle rate (a discount rate of 10% is considered to be the hurdle rate), with positive Economic Net Present Values (ENPVs). As it is apparent from the FIRR and EIRR values in Section E.6.3, with and without GCF grants for Components 2 (both elements) and 3, it is clear that the concessionality offered by GCF grants is essential to establish financial and economic viability and investment attractiveness for these Components.

174. For Component 3, given the public good nature of this Component, serving a remote and vulnerable community, the concessionality offered by a GCF grant to completely cover the capital costs of this installation is critical.

¹¹⁰ World Bank (2008), *The Welfare Impact of Rural Electrification: A Reassessment of the Costs and Benefits – An IEG Impact Evaluation*, <http://documents.worldbank.org/curated/en/2008/05/9850725/welfare-impact-rural-electrification-reassessment-costs-benefits-ieg-impact-evaluation>

¹¹¹ The project is only expected to be installed by 2019; however, since the CBA is being conducted now, constant 2015 prices are considered.

175. In addition, the high fiscal deficit of the Government of Mauritius, and the Government's debt reduction obligations under the Public Debt Management Act (see Section E.4.2), make the requested GCF grants very important to enable the Government to achieve its stated goal of accelerating the country's shift to a low-carbon economy. The IMF is already predicting that the Government may miss its statutory debt reduction target.

F.2. Technical Evaluation

Component 2: Improvement in Grid Absorption Capacity and PV Deployment

176. Rooftop solar PV systems have been chosen for the project for their cost-attractiveness (falling prices and low operational cost), their speed of implementation and, above all, their public acceptance. Although wind power generation is also an attractive option in Mauritius, its reception in the local context has been rather lukewarm. Two wind farms of 9.3 MW and 29.4 MW are in the pipeline¹¹² but the projects have been facing difficulties in their execution, especially public opposition.¹¹³ In addition, unlike wind generation, solar PV power generation can be integrated at different voltage levels on the network. Consequently, its deployment is much faster and more straightforward.

177. A series of technical studies carried out by specialist consultancy firms¹¹⁴ recommend the investment in grid stabilization measures as a prerequisite to accommodating a higher share of renewable energy on the Mauritian grid. Renewable energy sources of variable nature, such as wind and solar, have a direct impact on the stability of the grid if their power integration is not properly managed. For the integration of variable renewable energy sources, the allocation of spinning reserves on fast-acting conventional generators such as diesel engines, hydro-generators and gas turbines is important. However, such an approach by itself is inadequate for higher penetration of variable RE sources. In this respect, BESS, AGC, ADMS and AMI are a key means of ensuring grid stability. As Mauritius has an insular grid with no interconnections with neighbouring power systems, the need to ensure grid stability prior to the scale-up of renewable energy is paramount.

178. Distributed energy generation also offers grid loss reduction as an additional benefit. The existing electrical power system consists primarily of centralised conventional (diesel and gas) generation stations that are located in the Port Louis area (due to the nearby port facilities) and dual coal/bagasse-powered stations scattered around the island adjacent to sugarcane fields. Given that the load demand is distributed across the island, it is necessary to transport the power generated at the centralised power plants through the high-voltage transmission network, medium-voltage distribution network and low-voltage network to the customer. The transfer of power implies power and energy losses along the electrical conductors due to their physical properties. Transmission and distribution losses in the Mauritian grid average 7-8%.

179. Distributed generation from PV sources, being located in the vicinity of, or directly within, the load centres, will reduce the need for power transfer from distant power stations at the time when solar photovoltaic power is available, thereby reducing the energy losses along the transmission and distribution networks. The closer the distributed generation is to the customer requiring power, the greater is the prospect for network loss reduction. The actual improvement in the network losses due to distributed generation facilities will depend upon the installed PV capacity and the amount of load demand located adjacent to the distributed generation facilities. Although quantifying the actual reduction losses is complex (given the as-yet unknown locations of the distributed generation plants), a 1% reduction in losses equates to approximately 29,000 tCO₂ avoided (based on a conservative total of 2,885 GWh of electricity produced annually and considering a grid emission factor of 1.01 tCO₂/MWh).

Component 3: PV Mini-Grids on the Outer Island of Agalega

180. As per the findings of the technical assessment carried out under the UNDP-GEF 'Removal of Barriers to Solar PV Power Generation in Mauritius, Rodrigues and the Outer Islands' project (Annex IId), the only realistically exploitable renewable sources of energy on Agalega are biomass and solar energy. The North and South Islands benefit from about 2,000 hours of sunshine per year. This abundance of solar energy can be exploited for the

¹¹² http://www.indian-ocean-times.com/Maurice-11-eoliennes-construites-dans-le-Nord-de-l-ile-par-le-groupe-francais-Quadran_a5134.html

¹¹³ <http://www.lexpress.mu/article/environnement-la-construction-du-parc-%C3%A9olien-de-plaine-sophie-contest%C3%A9>

¹¹⁴ See Annexes IIa, IIb, IIg, IIh and IIi.

production of electricity. By factoring in the increasing domestic load (increase in the number of households with fridges, TV sets and other equipment) and the additional need for cooling during hot days, it is estimated that approximately 300 kW of generation capacity is required on the island with the following load distribution:

- Vingt Cinq (main economic hub) – 150 kW
- La Fourche – 75 kW
- Sainte Rita – 75 kW

181. These three villages already have mini-grids powered by diesel generators. Given the generous insolation levels available, hybrid system mini-grids (with a mixture of PV, batteries and diesel as back-up) are the most low-carbon option. Coupled with the appropriate power electronics / transformer (for power quality control and regulation), the hybrid system can easily be retrofitted in the utility space available in each village and ensure sufficient and reliable power at all times of the day and night.

182. The design of the system at the capacity stated above will also ensure that diesel generators are only minimally used while ensuring that energy requirements for cold storage and domestic uses are comfortably met. This will reduce the amount of diesel imported from mainland Mauritius (hence enhancing autonomy) and also improve the quality of life of the inhabitants through reduced noise / emission levels and increased revenue via boosted economic activities. In terms of diesel costs saved, it is estimated that 3 diesel generators (totalling 300 kW) running around the clock with a load factor of 50% will consume 450 litres of diesel daily. This amounts to 164,250 litres per year, representing a total of US\$ 200,385 saved per annum.

183. The cost per kWp for a solar PV system is currently ~US\$ 2,000. In the context of Agalega, since there is no need to invest in diesel generators, grid infrastructure or civil works, the cost of the total 300 kWp will be ~US\$2,000/kWp, amounting to US\$ 600,000 in total investment.

F.3. Environmental, Social Assessment, including Gender Considerations

184. The project has completed the UNDP social and environmental screening procedure (see SESP attached as Annex VI). This screening was undertaken to ensure the project complies with UNDP's Social and Environmental Standards. UNDP's Social and Environmental Standards were reviewed by the GCF Accreditation Panel and deemed sufficient to accredit UNDP to submit low- and medium-risk projects. The overall social and environmental risk category for this project is: **moderate**.

185. Specific project risks are listed in Section G below, together with appropriate mitigation measures. Given the type and scale of the rooftop PV systems addressed by the project, these technologies are exempted from the EIA requirements of Mauritius under the Environmental Protection Act (EPA, 2002 - amended 2008)¹¹⁵ – see Annex VIb.

186. The impacts of rooftop solar PV systems are considered moderate as they are site-specific, temporary (e.g. installation and decommissioning), and can be easily mitigated by proper siting, technical specifications, and design and construction standards. Some considerations in selecting sites for the rooftop solar PV systems will include: (i) proximity to the existing power transmission system (i.e. grid connection), (ii) the integrity of the building (i.e. its capacity to hold additional load, to maintain roof water-tightness, etc.); (iii) existing land use in the area; (iv) local climate (i.e. the solar resource, the variability in cloud cover, wind-speed, precipitation, etc.), and (v) accessibility (i.e. proximity to existing roads).

187. Various technical standards and specifications for solar PV systems established by the International Electro-technical Commission (IEC), the Institute of Electrical and Electronics Engineers (IEEE), and other recognised standard-setting organisations will be referred to in order to ensure a degree of reliability and safety of operation, minimising the risk of system failure.

¹¹⁵ <http://environment.govmu.org/English/eia/Pages/Environmental-Impact-Assessment.aspx>

188. Consultations with stakeholders will continue throughout the project cycle. A project-level grievance redress mechanism that is gender-sensitive following UNDP's SESP¹¹⁶ will be set-up to deal with any potential complaint or grievance. A project brief (i.e. a one-page flyer or FAQ) that will include the contact details of person(s) designated to receive complaints and suggestions will be made available to the public on the project website and from the offices of UNDP, the Executing Entity and the Responsible Parties.
189. A record of compliance with applicable Government regulations will be submitted annually by the Executing Entity and Responsible Parties to UNDP. Documentation of any complaint received by the Executing Entity and Responsible Parties will also be submitted to UNDP.
190. With regard to gender, a full Gender Assessment is provided in Annex VI. Furthermore, the UNDP Gender Seal Initiative¹¹⁷ requires UNDP to actively advocate for equal participation of men and women at all levels. Therefore, in terms of selection of women for different project jobs and by the private sector, UNDP will actively advocate for equal participation and opportunity of access, especially in the private sector where the number of potential employees is much greater.

Table 15: Gender Analysis

No	Project Component Name	Gender Analysis
1	Institutional strengthening for renewable energy	These components of the project will benefit the entire country and thus they are not biased against any gender.
2	Improving Grid Absorption Capacity and PV deployment	<p>In fact, the Constitution of Mauritius guarantees the equality of all citizens and the respect of fundamental rights and freedom. In 1995, the Constitution was amended to make sex discrimination illegal. The recent adoption of an Equal Opportunities Act¹¹⁸ in Mauritius constitutes an important step in the fight against sexual discrimination, by providing protection against sexual harassment and victimisation.</p> <p>To democratise access to rooftop PV systems in Mauritius, the GCF project will ensure that the socio-economic and gender profile of the PV beneficiaries will achieve a disproportionate skew towards lower-income households. As indicated in the 2012 Household Budget Survey (the latest such survey available, released in March 2015¹¹⁹), 20% of Mauritian households earn over Rs 40,000 per month ('high income'); 35% earn Rs 20-40,000 ('middle income'); and 45% earn less than Rs 20,000 per month ('low income').</p> <p>During implementation, gender-disaggregated data will be collected, along with other indicators of vulnerable households. If the first tranche of implementation does not provide sufficiently targeted assistance, the selection criteria will be biased toward favouring target groups in subsequent tranches.</p>
2	Improving Grid Absorption Capacity and PV deployment	Under these components, renewable energy and fuel efficiency projects will be conducted.
3	PV mini-grids on the Outer Island of Agalega	<p>It is to be noted that women in the Republic of Mauritius have identical access as men with regard to inheritance. Widows and widowers inherit the property of the deceased spouse, whatever the circumstances and the matrimonial regime, even if the deceased did not leave a written will. There are no legal or customary restrictions that favour male heirs over females.</p> <p>With respect to ownership of property other than land, women are treated equally with men under the law with respect to their legal rights to conclude contracts and administer property without the interference or consent of a male partner.</p>

¹¹⁶ <http://www.undp.org/content/dam/undp/library/corporate/Social-and-Environmental-Policies-and-Procedures/UNDPs-Social-and-Environmental-Standards-ENGLISH.pdf>

¹¹⁷ The UNDP Gender Seal strategy document is provided in Annex XIIIag.

¹¹⁸ <http://eoc.govmu.org/English/Know%20Your%20Rights/Pages/Scope-of-the-Law.aspx>

¹¹⁹ Provided in Annex XIIIaj.

		<p>There are no indications that Mauritian women face discrimination with regard to access to credit, such as bank loans. In a marriage under the community of property regime, either spouse must have their partner's consent to obtain a loan. Several measures have also been taken to ease the process of women's access to credit. The Development Bank of Mauritius (DBM) is also more flexible in its provision of developmental assistance for projects for women. A woman's specific situation (e.g. living separately from her husband or being in the process of divorce) is not an obstacle for her to take loans and start a business.</p> <p>Legally, men and women have equal rights with respect to economic opportunities, political participation, land tenure, property ownership, marriage and family.</p> <p>With regard to Components 1-3, the Ministry of Energy and Public Utilities (MEPU) has agreed to the following gender targets for the GCF project:</p> <ul style="list-style-type: none"> • At least 30% of MARENA Board members and at least 30% of MARENA staff are women • MARENA to define a supportive environment for policies and regulations that take into account the gender aspects of access to renewable energy • MARENA to establish sex-disaggregated data and relevant gender indicators on access to, and use of, renewable energy and to carry out gender-sensitive research relating to renewable energy • MARENA to undertake awareness campaigns on renewable energy for 500 women annually • Training of 100 female entrepreneurs in micro-enterprises to understand the technical aspects of PV systems • Introduction of technical training for women on the installation, operation and maintenance of solar PV systems • At least 33% participation of women in commercial PV-related activities.
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F.4. Financial Management and Procurement

191. The project will be executed under the UNDP National Implementation Modality (NIM). National implementation is used when there is adequate capacity in the national authorities to undertake the functions and activities of the project. UNDP has ascertained the national capacities of the implementing partners by hiring Deloitte to undertake an independent evaluation of capacity following the Framework for Cash Transfers to Implementing Partners (part of the Harmonised Approach to Cash Transfers – HACT). HACT assessments of MEPU, CEB, OIIC and MOFED, were carried out in December 2015, and the results and report are available in Annex VIIe. All implementing partners were judged by Deloitte to be Low Risk.

192. The implementing partner may follow its own procedures provided they conform to the UNDP Financial Regulations and Rules and Principles (see full details available at <https://info.undp.org/global/popp/ppm/Pages/Legal-Framework.aspx>.) The implementing partner may alternatively apply UNDP practices.

193. The UNDP Country Office may mobilise certain inputs on behalf of the implementing partner. In this case, UNDP establishes the contracts following UNDP rules and procedures, as well as the policies for Country Office support services. UNDP is then a Responsible Party for the provision of support services. Inputs are the personnel, goods, services and grants that are necessary and sufficient to produce the planned outputs. Inputs are obtained on the basis of the project work plan and the corresponding budget. Where the progress towards planned outputs is not advancing as expected, the Project Board shall review the strategy of the project, including the work plan, budget and inputs.

194. Project funds are financial resources mobilised from various sources to be used for project expenditures, as defined in the project budget. Project financial arrangements must be planned in this process, which may include funding from UNDP regular resources, Government cost-sharing, donor contributions, trust fund financing, etc.

195. According to the NIM modality, the Implementing Partner and Responsible Parties will each need to have a separate bank account opened for the project through the Accountant General at the Bank of Mauritius or a commercial bank. Authorised signatories must be provided to the UNDP Country Office.
196. Based on the approved budget in the Project Document, an Annual Work Plan (AWP) is prepared and signed at the start of each year. The Project Manager must ensure that the expenditures are made in line with the approved AWP. However, when deliverables are delayed and expenses not incurred in due course, the Project Manager may revise the budget during the year. Budget Revisions are recorded in UNDP's enterprise management system, ATLAS, by the UNDP Country Office and the revised AWP is signed again.
197. Each quarter, the implementing partner may request for funding through the Financial Report, which has to be submitted to UNDP. Under the Financial Report, the expenses are captured based on their account codes, which UNDP shall provide to the Project Manager. The UNDP Country Office captures all expenses in its system (ATLAS) to monitor the progress of the funding and also to see whether the Implementing Partner is adhering to the planned budget. The Implementing Partner makes a request for cash advance based on its quarterly work plan and budget. The cash advance is used by the Implementing Partner to meet its quarterly expenses as per the planned budget.
198. On a quarterly basis, a financial report is prepared by the Project Manager, signed by the National Project Director and submitted to UNDP in order to report on expenditure in the previous quarter and request for funding for the forthcoming quarter. Nevertheless, if all the funds, or 80% of the funds advanced in the previous quarter, are not utilised, the cash advance is not processed for the forthcoming quarter. The Financial Report contains all the expenditures made by the Implementing Partner and Responsible Parties during the quarter aligned through their respective activities as per the AWP and Chart of Accounts which the UNDP Country Office provides to the Project Manager. The Financial Report is scrutinised by the Programme Officer at the UNDP Country Office and submitted for signature by the UNDP Resident Representative. The request for cash advance is made while submitting the Financial Report, which must be approved and signed by the National Project Director and the UNDP Resident Representative after having been vetted by the UNDP Programme Officer in charge of the project.

Audit

199. National implementation projects have to be audited at least once in the life of the project, and each year that it is considered appropriate by the Country Office (depending on level of delivery, difficulties found during the year, etc.). The funds advanced to the project are under the total responsibility of the Implementing Partner and the Responsible Parties and must only be used for the activities and inputs stated in the annual work plan, and following UNDP's policies and procedures as referred to in the project document. The Implementing Partner and Responsible Parties must have a good system of accounting, recording and appropriate filing of financial documentation on the project (in order to maintain records of all payments made with advances and original expenditure back-up documentation). All of these requirements and information will be reviewed at the project site during the project audit. The audit will conform with the requirements agreed in the Accreditation Master Agreement between UNDP and the GCF.

Government Procurement

200. In general, procurement of services and goods related to all major development projects/programmes of a public nature in Mauritius has to follow the Public Procurement Act 2006 and other associated procurement regulations (complete information is available at <http://publicprocurement.govmu.org/>). With regard to Component 2, CEB shall use its usual processes for both procurement and contract management in order to ensure effective operational arrangements with prospective counterparties. The procurement plan for the GCF project is provided in Annex Vc.
201. Public Procurement in Mauritius is governed by the Public Procurement Act 2006 (PPA). After the proclamation of the PPA in 2008, public procurement has been performed under a framework based on a three-tier structure: (i) a Procurement Policy Office (PPO) exercising oversight through compliance monitoring and evaluation; (ii) a Central Procurement Board (CPB) with the responsibility to approve awards of public contracts above prescribed



thresholds; and (iii) an Independent Review Panel (IRP) to settle procurement grievances. This structure aims to achieve value for money and deliver quality public services with integrity, accountability, legality and transparency.

G.1. Risk Assessment Summary

202. The project has been screened according to UNDP's Social and Environmental Procedure and the following potential risks have been identified. The small-scale rooftop PV systems and fuel-efficient hybrid buses addressed by the project are exempted from the EIA requirements of Mauritius under the Environmental Protection Act (EPA, 2002 - amended 2008) – see Annex VIb.

203. The risks identified in the ESIA analysis are as follows:

- Delay in procurement of necessary technical assistance for the various components: Moderate
- Duty-bearers may not have the capacity to meet their obligations to the project: Moderate
- Potential for the project to reproduce discrimination against women's participation: Low
- Vulnerability to climate change: Moderate
- Vulnerability to geological hazards such as earthquakes: Low
- Transport, installation and decommissioning of the PV systems on rooftops may pose potential safety risks to local communities and workers: Low
- Potential failure of structural elements of rooftop PV systems can pose risks to communities: Low
- Generation of waste: Moderate

204. Based on the above, the maximum risk category is Moderate and, therefore, the risk category for the overall project is **Moderate**. Section G.2 below considers the risk mitigation measures required for the smooth operation of the project.

G.2. Risk Factors and Mitigation Measures

Please describe financial, technical and operational, social and environmental and other risks that might prevent the project/programme objectives from being achieved. Also describe the proposed risk mitigation measures.

Selected Risk Factor 1

Description	Risk category	Level of risk	Probability of risk occurring
Delay in procurement of necessary technical assistance for the various components.	Technical and operational	Low (<5% of project value)	Medium

Mitigation Measure(s)

The UNDP Country Office will put its procurement processes at the disposal of the Government of Mauritius. Under the National Implementation Modality, UNDP may undertake procurement for Government based on a Letter of Agreement and UNDP's Cost Recovery Policy. In general, UNDP procurement timelines are shorter than Government procurement schedules.

Selected Risk Factor 2

Description	Risk category	Level of risk	Probability of risk occurring
Duty-bearers may not have the capacity to meet their obligations to the project.	Social and environmental	Low (<5% of project value)	Medium

Mitigation Measure(s)

Project elements will include: (i) the establishment of the Mauritius Renewable Energy Agency, which will be responsible for promoting and facilitating the expansion of the RE sector; (ii) development of additional relevant legislation, and (iii) training to Government and the private sector (notably SMEs) on solar PV. These elements are expected to increase stakeholders' capacities. Capacity building will take place for the Mauritius Renewable Energy Agency, thereby empowering it to meet its responsibilities fully.

Selected Risk Factor 3

Description	Risk category	Level of risk	Probability of risk occurring
Potential for the project to reproduce discrimination against women's participation.	Social and environmental	Medium (5.1-20% of project value)	Low

Mitigation Measure(s)

- Gender-disaggregated data will be used for monitoring outputs, outcomes and impacts during project implementation to ensure women's participation in capacity building and employment opportunities.
- Capacity-building elements incorporated in the project design that will have female participation are: (i) Component 1 will ensure gender balance (as appropriate) in the recruitment of Mauritius Renewable Energy Agency staff as well as in the dedicated training on project development; (ii) Component 2 will offer training to the private sector (with a particular focus on SMEs) in the installation, operation and maintenance of PV systems; and (iii) Component 3 will offer gender-sensitive training on the use of renewable energy to ODC staff and selected inhabitants of Agalega.

Selected Risk Factor 4

Description	Risk category	Level of risk	Probability of risk occurring
Vulnerability to climate change.	Social and environmental	Medium (5.1-20% of project value)	Medium

Mitigation Measure(s)

- Site selection will include locations with good insolation characteristics and where there are minimal hindrances to PV functioning.
- The project will consider PV modules with a higher temperature coefficient if most sites available are expected to have high temperature increases or experience significant heat waves.
- Specifically for Agalega, the project will consider taking out catastrophic or performance guarantee insurance to protect against degradation.
- Also specifically for Agalega, a maintenance plan will be devised for ODC and its implementation monitored until the end of the project through bi-annual site visits by the Project Coordinator and the Component 3 Project Manager.

Selected Risk Factor 5

Description	Risk category	Level of risk	Probability of risk occurring
Vulnerability to geological hazards such as earthquakes.	Social and environmental	Low (<5% of project value)	Low

Mitigation Measure(s)			
<ul style="list-style-type: none"> Structural integrity will be a major criterion in determining the suitability of a building for a rooftop solar PV system to ensure it can support the weight of the system (including 'dead load'). Design of rooftop PV systems will incorporate applicable national structural engineering, construction and technical standards and/or international standards such as those from IEC, IEEE, ASTM, UL, etc. 			
Selected Risk Factor 6			
Description	Risk category	Level of risk	Probability of risk occurring
Transport, installation and decommissioning of the PV systems on rooftops may pose potential safety risks to local communities and workers.	Technical and operational	Medium (5.1-20% of project value)	Low
Mitigation Measure(s)			
<ul style="list-style-type: none"> A safety management plan will be required from the developer / EPC contractor(s) and sub-contractor(s), and will be implemented and monitored for compliance during construction and decommissioning. Workers will have orientation and regular training on safe working at height. Personal protective equipment will be provided to workers. Clear warning / danger signs will be installed to alert local communities of PV installation / decommissioning work. 			
Selected Risk Factor 7			
Description	Risk category	Level of risk	Probability of risk occurring
Potential failure of structural elements of rooftop PV systems can pose risks to communities.	Technical and operational	Medium (5.1-20% of project value)	Low
Mitigation Measure(s)			
<ul style="list-style-type: none"> Rooftop site selection criteria will include the presence of trees adjacent to the building. The developer / EPC contractor / sub-contractor will be required to ensure that only certified electrical contractors with experience in PV systems are allowed to install the solar units. Prominent warning signs will be installed at designated locations so that persons, particularly those with disabilities, are able to recognise the potential danger. A regular maintenance and cleaning project for the solar panels will be implemented to ensure no debris accumulates beneath the panels; trimming of nearby trees (if trees cannot be avoided) will ensure a safe distance from the panels; and inspection of wiring and cables. A safety management plan will be required from the developer / EPC contractor(s) and sub-contractor(s) and will be implemented throughout the project cycle. 			
Selected Risk Factor 8			
Description	Risk category	Level of risk	Probability of risk occurring
Generation of waste.	Social and environmental	Low (<5% of project value)	Medium

Mitigation Measure(s)			
<ul style="list-style-type: none"> Project EPC contractor(s) and sub-contractor(s) will be required to prepare and implement a waste management plan, which will include measures such as segregation at source, 3Rs, and for manufacturers to take back PV panels either at the end of their lifetimes or as they are replaced. Good housekeeping during construction will be strictly implemented. All recyclable wastes, including damaged solar panels and metal racks, will be sorted at source and properly collected for recycling while biodegradable wastes will be composted. Other solid wastes and non-compostable wastes will be collected and disposed of following the requirements of the Local Government Act 2011, and Local Government Regulations 2003 and 2004.¹²⁰ 			
Selected Risk Factor 9			
Description	Risk category	Level of risk	Probability of risk occurring
The need for continued political support for institutional strengthening (Component 1).	Social and environmental	Low (<5% of project value)	Low
Mitigation Measure(s)			
<ul style="list-style-type: none"> The MARENA Bill was passed by Parliament on 29 September 2015. In addition, the NDC clearly states that the Government of Mauritius will implement renewable energy projects subject to the availability of international technical assistance and funding. The Minister of Energy and Public Utilities is on record in Parliament (Hansard, page 107: Annex XIIIai) as stating the importance of the GCF project to the Central Electricity Board and CEB's strategic priorities. The project will be executed nationally through UNDP's National Implementation Modality (NIM) and has the full support of the GCF NDA and the relevant line ministries. There can, therefore, be little doubt about continued political support and, consequently, this risk is considered to be very low. 			
Selected Risk Factor 10			
Description	Risk category	Level of risk	Probability of risk occurring
Failure of private sector installers of PV systems to continue supporting and providing O&M to equipment (Components 2 and 3).	Technical and operational	Medium (5.1-20% of project value)	Low
Mitigation Measure(s)			
<ul style="list-style-type: none"> There are currently approximately 20 suppliers of PV systems in Mauritius. A list of 18 that were operating under SSDG phases 1 and 2 is annexed (Annex XIIIan). The large number of PV private sector operators and the competitive environment in which they operate means that this risk is considered to be very low. O&M and after-sales service have not proved to be problems during SSDG phases 1, 2 and 3, and the growth in suppliers and technical expertise during phases 1, 2 and 3 is expected to reduce this risk even further in phase 4. 			

¹²⁰ <http://localgovernment.govmu.org/English/Legislations/Pages/Local-Government-Act.aspx>

H.1. Logic Framework.

Please specify the logic framework in accordance with the GCF's [Results Management Framework](#) and [Performance Measurement Framework](#).

H.1.1. Paradigm Shift Objectives and Impacts at the Fund level¹²¹

Paradigm shift objectives

<i>Shift to low-emission sustainable development pathways</i>	The project will contribute to two key Fund-Level Impacts, namely through reduced emissions through increased low-emission energy access and power generation by enabling the volume of intermittent renewables on the national grid to be increased substantially.
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Expected Result	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term (if applicable)	Final	

Fund-level impacts

Expected Result	Indicator	Means of Verification (MoV)	Baseline	Mid-term (if applicable)	Final	Assumptions
M1.0 Reduced emissions through increased low-emission energy access and power generation	Tonnes of carbon dioxide equivalent (tCO ₂ eq) reduced or avoided as a result of Fund funded projects / programmes	Mid-Term and Final Evaluation Reports to have dedicated sections on CO ₂ emission reductions Digest of Environment Statistics	0	24,240 (direct)	196,000 (direct) 484,800 (indirect)	<ul style="list-style-type: none"> • Estimation over lifetime of project (8 years) and not equipment lifetime • CEB meets its target of a total of 185 MW installed capacity during project lifetime • Mid-term is end-2020 • The procurement process is efficient and timely • Low staff turnover for the duration of the project, ensuring there is no discontinuity • Phase 1 of the GCF project is completed on time and there is a smooth flow of funds into Phase 2

H.1.2. Outcomes, Outputs, Activities and Inputs at Project/Programme level

Expected Result	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term (if applicable)	Final	
Project / programme outcomes	Outcomes that contribute to Fund-level impacts					

¹²¹ Information on the Fund's expected results and indicators can be found in its Performance Measurement Frameworks available at the following link (Please note that some indicators are under refinement): http://www.qcfund.org/fileadmin/00_customer/documents/Operations/5.3_Initial_PMF.pdf

M5.0 Strengthened institutional and regulatory systems	Institutional and regulatory systems that improve incentives for low-emission planning and development and their effective implementation	Legal text Government budget Building and staff contracts	Renewable Energy Agency existing at Board level only (MARENA)	Additional Legislation Enacted 10 Staff recruited	MARENA operational in 2019 MARENA staff fully trained	Government remains committed to establishment of MARENA
M6.0 Increased number of small, medium and large low-emission power suppliers	Proportion of low-emission power supply in a jurisdiction or market	CEB Digest of Energy Statistics	20%	28%	35% in 2024	Grid Absorption Capacity improvement completed
	Number of households, and individuals (males and females) with improved access to low-emission energy sources	CEB Digest of Energy Statistics	83,000 households Males: 124,828 Females: 127,350	100,000 households Males: 174,760 Females: 178,292	129,500 households Males: 218,450 Females: 222,865	Based on estimate of low-emission MW divided by effective capacity of the power system, multiplied by total number of households / household composition in Mauritius and Rodrigues
Expected Result	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term	Final	
Project / programme outputs	Outputs that contribute to outcomes					
PHASE ONE (2017-2019)			2017	2018	2019	
1.1 Institutional strengthening of the Mauritius Renewable Energy Agency	Renewable Energy Agency Act in place Institution staffed by mid-term	Legislation available on Supreme Court website Staff contracts	Legislation voted No staff contracted	Supplementary legislation – regulations and standards drafted 10 staff recruited	MARENA functioning as a fully-fledged agency 15 staff recruited	Government maintains policy of promoting RE
Expected Result	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term	Final	
PHASE ONE (2017-2019)			2017	2018	2019	
2.1 Improving Grid Absorption Capacity to accept 185 MW intermittent RE	Software purchased Battery energy storage system procured	Software licence Physical check for batteries	No AGC software installed No batteries Grid able to accept 60 MW	AGC software and batteries purchased and installed Grid able to accept 100 MW	All equipment installed and grid able to accept a total of 185 MW installed RE capacity	Government maintains policy of promoting RE

Expected Result	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term	Final	
PHASE TWO (2020-2024)			2020	2022	2024	
2.2 Smart grid	Advanced Distribution Management system Smart Grid Strategy	Physical verification and report on installation of the equipment Smart Grid Roadmap document	No ADMS	ADMS partly installed Long-term smart grid strategy under preparation	ADMS completely installed Long-term smart grid strategy developed	Government acknowledges the power stability benefits of smart grids and is keen to invest further
2.3 PV deployment	Actual MW installed by category (gender-disaggregated data)	Power Purchase Agreements and project records Annual Report of CEB	5 MW PV under Phases 1, 2 and 3 of the SSDG 25 MW utility-scale PV on the grid	Additional 2 MW on grid from NGOs and 5 MW from households 5 MW from Public Buildings 65 MW PV utility-scale	4 MW capacity on grid from NGOs and 10 MW from households. 11 MW capacity installed on public buildings 130 MW utility-scale renewable energy	Price of fossil fuels does not fall markedly in the medium-term
3.1 PV mini-grids on the outer island of Agalega	Capacity of PV systems installed Number of OI DC staff trained	Tender documentation and installation report Training report	Existing systems are not functional No one trained	300 kW PV systems fully operational 3 females and 5 males trained	300 kW PV systems remain fully operational	OI DC is able to provide the budget for long-term maintenance and is supported by the Ministry of Ocean Economy
Activities	Description		Inputs		Description	
1.1.1 Preparation of legislation	Drafting of legislation / regulations/standards		Technical assistance		Hiring of consultants to assist in preparation of legislation and defining the terms of the Agency	
1.1.2 Capacity building for MARENA staff	Training programme		Technical assistance		Definition of the requirements of MARENA and deployment of the training programme, ensuring at least 30% female participation	
Activities	Description		Inputs		Description	
2.1.1 Installation of AGC system by CEB	AGC software is purchased, installed and commissioned by CEB		Funds provided to CEB		Following competitive tender and based on technical specifications of Mercados report, CEB financially supported for the purchase of AGC software	
2.1.2 Battery energy storage system installed	Batteries and equipment installed at strategic locations by CEB		Funds provided to CEB		Following competitive tender and based on technical specifications of Mercados	

			report, CEB procures batteries and equipment
2.1.3 Training programme	25 CEB staff trained in use of AGC software and maintenance of equipment installed under the project	Funds provided to CEB	Supplier of software and equipment to provide training to relevant CEB staff
2.2.1 ADMS	Tender documents prepared and ADMS equipment procured as required	Funds provided to CEB	ADMS procured and installed at the selected location
2.2.2 Capacity building on smart grid management	Training programme on smart grid management for 25 CEB staff	Funds provided to CEB	CEB staff trained by supplier of smart grids in using the system and maintaining it
2.2.3 Long-Term Smart Grid Strategy developed	Plan for expansion of Smart Grid	Technical assistance	Hiring of consultants to review the system and develop a long-term plan for further smart grid implementation
2.3.1 SSDG Phase 4 for NGOs and households	Quota fulfilled for NGOs (4 MW) and households (10 MW) using augmented Social Register of Mauritius	Technical assistance and funds provided	Consultant hired to define the social criteria to be used by CEB. UNDP Small Grants Programme to assist if needed
2.3.2 SSDG Phase 4 for public buildings	Quota fulfilled for public buildings (11 MW)	Technical assistance and procurement of equipment	Consultant hired to assist in design and installation, and PV panels and associated equipment procured
2.3.3 Expansion of PV usage on public buildings	In collaboration with MEPU and relevant stakeholders, CEB to select public buildings for installation of PV panels	Technical assistance and funds provided	CEB to prepare specifications and consultant to be hired to supervise installation of the PV panels
Activities	Description	Inputs	Description
3.1.1 Procurement and shipping of PV panels and batteries to Agalega	Preparation of tender documents, and specifications for purchase and shipping of 300 kW PV panels and associated equipment to Agalega	Technical assistance and funds provided to OIDC	Consultant to be hired for the Outer Island Development Corporation to supply and deliver PV panels and equipment
3.1.2 Commissioning of PV systems and training of local inhabitants	300 kW PV system to be installed at Agalega, and commissioned to provide 300 inhabitants with 24-hour supply of electricity	Technical assistance	Supplier to commission PV system
3.1.3 Training of local inhabitants and OIDC staff	3 local inhabitant technical staff (including at least one female) and 5 OIDC staff (including at least 2 females) trained to maintain the PV panels and associated equipment by the PV installer	Technical Assistance	Supplier to deliver training to Agalega inhabitants

H.2. Arrangements for Monitoring, Reporting and Evaluation

205. UNDP will perform monitoring and reporting throughout the Reporting Period in accordance with the AMA. UNDP has the country presence and capacity to perform such functions. In the event of any additional post-implementation obligations over and above the AMA, UNDP will discuss and agree these with the GCF Secretariat in the final year of the Reporting Period and will prepare a post-Reporting Period plan and budget for approval by the GCF Board as necessary.
206. Project-level monitoring and evaluation will be undertaken in compliance with the UNDP POPP and the UNDP Evaluation Policy.
207. The primary responsibility for day-to-day project monitoring and implementation rests with the Project Coordinator. The Project Coordinator, in conjunction with the Project Managers, will develop annual work plans to ensure the efficient implementation of the project. The Project Coordinator will inform the Project Board and the UNDP Country

Office of any delays or difficulties during implementation, including the implementation of the M&E plan, so that the appropriate support and corrective measures can be adopted. The Project Coordinator will also ensure that all project staff maintain a high level of transparency, responsibility and accountability in monitoring and reporting project results.

208. The UNDP Country Office will support the Project Coordinator and Project Managers as needed, including through annual supervision missions. The UNDP Country Office is responsible for complying with UNDP project-level M&E requirements as outlined in the UNDP POPP. Additional M&E and implementation quality assurance and troubleshooting support will be provided by the UNDP Regional Technical Advisor as needed. The project target groups and stakeholders, including the GCF NDA, will be involved as much as possible in project-level M&E.
209. A project inception workshop will be held after the UNDP project document has been signed by all relevant parties to: a) re-orient project stakeholders to the project strategy and discuss any changes in the overall context that influence project implementation; b) discuss the roles and responsibilities of the project team, including reporting and communication lines and conflict resolution mechanisms; c) review the results framework and discuss reporting, monitoring and evaluation roles and responsibilities and finalise the M&E plan; d) review financial reporting procedures and mandatory requirements, and agree on the arrangements for the annual audit; e) plan and schedule Project Board meetings and finalise the first year annual work plan. The Project Coordinator will prepare the inception report no later than one month after the inception workshop. The final inception report will be cleared by the UNDP Country Office and the UNDP Regional Technical Advisor, and will be approved by the Project Board.
210. A Project Implementation Report (PIR) will be prepared for each year of project implementation. The Project Coordinator, the UNDP Country Office and the UNDP Regional Technical Advisor will provide objective input into the annual PIR. The Project Coordinator will ensure that the indicators included in the project results framework are monitored annually well in advance of the PIR submission deadline and will objectively report progress in the Development Objective tab of the PIR. The annual PIR will be shared with the Project Board and other stakeholders. The UNDP Country Office will coordinate the input of the NDA and other stakeholders to the PIR. The quality rating of the previous year's PIR will be used to inform the preparation of the next PIR. The final PIR, along with the final evaluation report and corresponding management response, will serve as the final project report package.
211. Two Mid-Term Evaluations will be undertaken, early in year 3 and in mid-year 5, and the findings and responses outlined in the management response will be incorporated as recommendations for enhanced implementation during the project's duration. The terms of reference, the review process and the final evaluation reports will follow the standard templates and guidance available from the UNDP Independent Evaluation Office (IEO). The reports will be cleared by the UNDP Country Office and the UNDP Regional Technical Advisor, and will be approved by the Project Board. The evaluation reports will be publicly available in the English language, on the IEO website. The completion of the first mid-term evaluation (in year 3) with a Satisfactory rating or better will be one of the pre-conditions for transitioning to Phase 2.
212. An independent final evaluation (TE) will take place no later than five months prior to the operational closure of Phase 2 of the project. The terms of reference, the review process and the final TE report will follow the standard templates and guidance available from the UNDP Evaluation Resource Centre. The final TE report will be cleared by the UNDP Country Office and the UNDP Regional Technical Advisor, and will be approved by the Project Board. The TE report will be available in English. The UNDP Country Office will include the planned project final evaluation in the UNDP Country Office evaluation plan, and will upload the final evaluation report and the management response in English to the public UNDP Evaluation Resource Centre (ERC) (www.erc.undp.org).
213. The UNDP Country Office will retain all M&E records for this project for up to seven years after project financial closure in order to support ex-post evaluations.
214. A detailed M&E budget, monitoring plan and evaluation plan will be included in the UNDP project documents.

I. Supporting Documents for Funding Proposal

- NDA No-objection Letter (Annex I)
- Feasibility Study (Annex II)
- Integrated Financial Model that provides sensitivity analysis of critical elements (xls format) (Annex III)
- Confirmation letter or letter of commitment for co-financing commitment (Annex IV)
- Term Sheet (Annex V)
- Environmental and Social Impact Assessment (ESIA) (Annex VI)
- Appraisal Report or Due Diligence Report with recommendations (Annex VII)
- Evaluation Report of the baseline project (Annex VIII)
- Map indicating the location of the project/programme (Annex IX)
- Timetable of project/programme implementation (Annex X)
- Project/programme confirmation (see the template in Annex I to the Accreditation Master Agreement) (Annex XI)
- Economic analysis (Annex XII)
- Additional background details (Annex XIII)
- Responses to GCF review comments (Annex XIV)

** Please note that a funding proposal will be considered complete only upon receipt of all the applicable supporting documents.*

Annexes

Ia: Letter of no objection
Ib: Letter of support from UNFCCC Focal Point

IIa: Grid absorption capacity study
IIb: SSDG incentive scheme
IIc: SSDG incentive model
IId: Agalega technical assessment
IIe: Agalega costing study
IIf: Smart grid roadmap – inception report
IIg: Smart grid roadmap – situation analysis
IIh: Smart grid roadmap – technology assessment
Iii: Smart grid roadmap – project report

IIIa: Grid strengthening financial model
IIIb: Grid strengthening economic model
IIIc: PV financial model
IIId: PV economic model
IIIe: Agalega financial model
IIIf: Agalega economic model

IVa: Co-finance chapeau letter
IVb: Government co-finance

IVc: CEB co-finance
IVd: UNDP co-finance
IVe: AFD co-finance

Va: Term sheet
Vb: Project budget
Vc: Procurement plan

VIa: Environmental & social impact assessment
VIb: Environmental & social checklist
VIc: Waiver letter from Ministry of Environment
VI d: Environmental and social management plan
VIe: Gender assessment and action plan
VI f: Environmental and social reports disclosure

VIIa: LPAC minutes
VIIb: LPAC attendee list
VIIc: Due diligence report
VIId: HACT assessments

VIII: Mid-term review of the GEF PV project

IXa: Grid map of Mauritius
IXb: Grid map of Mauritius (2)
IXc: Grid map of Mauritius (3)
IXd: Map of Agalega

X: Timetable of project implementation

XI: Project confirmation

XII: Financial and economic cost-benefit analysis

XIIIa: Grid codes
XIIIb: SSDG grid code
XIIIc: MSDG grid code
XIII d: MSDG grid code (2)
XIIIe: Power purchase agreements
XIII f: Photos of rooftop PV installations
XIIIg: GHG emission reduction calculations
XIIIh: UNDP-AFD MoU
XIIIi: Outline Energy Policy
XIIIj: Long-Term Energy Strategy
XIIIk: TOR – Project manager, component 1
XIII l: TOR – Project assistant, component 1
XIII m: TOR – Project manager, component 2
XIII n: TOR – Project assistant, component 2
XIII o: TOR – Project manager, component 3
XIII p: TOR – Project coordinator
XIII r: TOR – Project assistant
XIII s: TOR – Finance assistant
XIII t: Mauritius adaptation strategy
XIII u: SBAA

- XIIIv: CPAP
XIIIw: MARENA Bill
XIIIx: Hansard record of MARENA debate
XIIIy: Integrated electricity plan (2014)
XIIIz: Energy strategy – updated action plan (2014)
XIIIaa: World Bank Mauritius study
XIIIab: INDC
XIIIac: Minister quoted in Hansard
XIIIad: CEB renewable energy expression of interest
XIIIae: CEB SSDG communique
XIIIaf: CEB SSDG communique (2)
XIIIag: UNDP gender seal
XIIIah: List of 18 PV suppliers
XIIIai: Hansard GCF quotes
XIIIaj: Household budget survey
XIIIak: Implementation approval letter from UNDP CO
XIIIal: Implementation approval letter from UNDP GEF Coordinator
XIIIam: Project flow-chart showing monetary flows
XIIIan: Mauritius Environment Programme (2008-12) – Outcome Evaluation
XIIIao: Letter from Central Electricity Board regarding need for BESS and smart grid
XIIIap: Letter from Grune & Hornstrup relating to grid battery storage
XIIIaq: IMF Country Report for Mauritius
XIIIar: UK Smart Grid Vision and Routemap
XIIIas: IEA – Smart Grids in Distribution Networks
XIIIat: On-granting
- XIV: Response matrices
- 24 August 2015
 - 18 September 2015
 - 6 October 2015
 - 8 December 2015
 - 20 July 2016
 - 8 August 2016
 - 5 September 2016
 - 20 October 2016

No-objection letter issued by the national designated authority



MINISTRY OF FINANCE AND ECONOMIC DEVELOPMENT

Government Centre, Port Louis, Mauritius

reply please quote **CF/50/70/85 V3**

Date: 21 October 2016

Howard Bamsey
Executive Director
Secretariat of the Green Climate Fund
G-Tower, 175 Art Center-daero, Songdo-dong
Yeonsu-gu, Incheon City, Republic of Korea
Email: secretariat@gcfund.org / readiness@gcfund.org

Dear Sir,

Letter of No-objection to the revised proposal of the GCF Project, 'Accelerating the Transformational Shift to a Low-Carbon Economy in the Republic of Mauritius'

We refer to the project **Accelerating the Transformational Shift to a Low-Carbon Economy in the Republic of Mauritius** as included in the funding proposal submitted by UNDP to us on 20 October 2016.

The undersigned is the duly authorized National Designated Authority point of Mauritius. Pursuant to GCF decision B.08/10, the content of which we acknowledge to have reviewed, we hereby communicate our no-objection to the project as included in the funding proposal.

By communicating our no-objection, it is implied that:

- (a) The Government of Mauritius has no-objection to the project as included in the funding proposal;
- (b) The project as included in the funding proposal is in conformity with the national priorities, strategies and plans of Mauritius;
- (c) In accordance with the GCF's environmental and social safeguards, the project as included in the funding proposal is in conformity with relevant national laws and regulations.

We also confirm that our national process for ascertaining no-objection to the project as included in the funding proposal has been duly followed.

We acknowledge that this letter will be made publicly available on the GCF website.

Yours faithfully



Gerard Pascal Bussier
Director

Development Cooperation & Regional Initiatives
National Designated Authority for GCF

Environmental and social report(s) disclosure

Basic project information	
Project title	Accelerating the transformational shift to a low-carbon economy in the Republic of Mauritius
Accredited entity	UNDP
Environmental and social safeguards (ESS) category	Category B

Environmental and Social Impact Assessment (ESIA) (if applicable)	
Date of disclosure on accredited entity's website	2016-10-21
Language(s) of disclosure	English
Link to disclosure	http://www.mu.undp.org/content/mauritius_and_seychelles/en/home/library/environment_energy/publication_3/
Other link(s)	http://
Environmental and Social Impact Assessment (ESMP) (if applicable)	
Date of disclosure on accredited entity's website	2016-10-26
Language(s) of disclosure	English
Link to disclosure	http://www.mu.undp.org/content/mauritius_and_seychelles/en/home/library/environment_energy/publication_3
Other link(s)	http://
Resettlement Action Plan (RAP) (if applicable)	
Date of disclosure on accredited entity's website	N/A
Language(s) of disclosure	N/A
Link to disclosure	http://
Other link(s)	http://