GEF-6 REQUEST FOR PROJECT ENDORSEMENT/APPROVAL

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

PART I: PROJECT INFORMATION

Project Title: **Sustainable development of Comoros Islands by promoting the geothermal energy resources.**			
Country(ies):	**Union of Comoros**	GEF Project ID:	9040
GEF Agency(ies):	UNDP	GEF Agency Project ID:	5484
Other Executing Partner(s):	UNDP – National Implementation Modality	Submission Date:	22 December 2017
GEF Focal Area (s):	Climate Change	Project Duration (Months)	72
Name of Parent Program	n/a	Agency Fee ($)	561,038

A. FOCAL AREA STRATEGY FRAMEWORK AND OTHER PROGRAM STRATEGIES

Focal Area Objectives/Programs	Focal Area Outcomes	Trust Fund	(in $)	
			GEF Project Financing	Co-financing
CCM-1: Technology Transfer, and Supportive Policies and Strategies.	Programme 2: Develop and demonstrate innovative policy packages and market initiatives to foster new range of mitigation actions.	GEF	5,905,662	48,360,000
Total project costs			**5,905,662**	**48,360,000**

B. PROJECT DESCRIPTION SUMMARY

Project Objective: To promote geothermal energy resource development in the country for base-load electricity generation.

Project Components/ Programs	Financing Type	Project Outcomes	Project Outputs	Trust Fund	(in $)	
					GEF Project Financing	Confirmed Co-financing
1. Policy, regulatory, legislative and financial de-risking instruments for geothermal energy development.	TA	Streamlined and comprehensive market-oriented energy policy, legal/regulatory framework and financial instruments for geothermal energy-based power plants	1.1 Policy and legislative package for Geothermal Energy development adopted. 1.2 Cornerstone financial de-risking instruments for geothermal energy development defined, adopted and implemented.	GEF TF	500,000	1,500,000
2. Upstream geothermal preparation and development.	INV	Geothermal resource availability is assessed, established and 10 MW power station is operational.	2.1 Completed surface exploration assessment of Comoros geothermal resource potential. 2.2 Exploration-cum-production wells drilling and testing completed.	GEF TF	4,500,000	43,360,000

			2.3 10 MW of geothermal-based power generation capacity.			
3. Knowledge management and investment promotion.	TA	Increased awareness about geothermal potential and investment climate.	3.1: Public Relations and investment promotion campaign conducted. 3.2: Guidebook on geothermal development in Comoros published. 3.3: Published materials (including video) and informational meetings with stakeholders in SIDS countries having geothermal potential on project experience/best practices and lessons learned.	GEF TF	650,000	2,700,000
			Subtotal		5,650,000	47,560,000
			Project Management Cost (PMC)[1]	GEF TF	255,662	800,000
			Total project costs		**5,905,662**	**48,360,000**

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

Sources of Co-financing	Name of Co-financier	Type of Cofinancing	Amount ($)
National Government	Vice-Presidency responsible for Energy	In-kind	680,000
GEF Agency	UNDP	Grants	500,000
Donor Agency	World Bank	Loans	5,000,000
Donor Agency	European Union	Grants	3,700,000
Donor Agency	African Development Fund	Loans	20,000,000
Donor Agency	Arab Fund for Economic Development	Grants/Loans	10,000,000
Donor Agency	Government of New Zealand	Grants	5,000,000
Donor Agency	Fund for Countries in Transition (FAT)	Grants	3,000,000
Donor Agency	Sustainable Energy Fund for Africa	Grants	480,000
Total Co-financing			**48,360,000**

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

GEF Agency	Trust Fund	Country Name/Global	Focal Area	Programming of Funds	(in $)		
					GEF Project Financing (a)	Agency Fee a) (b)[2]	Total (c)=a+b
UNDP	GEF TF	Climate Change	Union of Comoros		5,905,662	561,038	6,466,700
Total Grant Resources					5,905,662	561,038	6,466,700

E. PROJECT'S TARGET CONTRIBUTIONS TO GLOBAL ENVIRONMENTAL BENEFITS

Provide the expected project targets as appropriate.

Corporate Results	Replenishment Targets	Project Targets
4. Support to transformational shifts towards a low-emission and resilient development path	750 million tons of CO_{2e} mitigated (include both direct and indirect)	Direct emission reductions: *1,882,125 tonnes* Consequential emission reductions (bottom up): *5,481,000 tonnes*

F. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT? NO.

PART II: PROJECT JUSTIFICATION

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

1. The PIF envisaged a project duration of 5 years for implementation. However, in view of the long lead times that may be necessary to complete all activities under the project, the Validation Workshop decided that the project duration should be extended to 6 years from the initial 5 years. This is designed to obviate the need for an extension, should the original time-frame of 5 years prove to be insufficient to successfully complete all project activities.

2. The PIF also envisaged that the proposed UNDP-GEF project will only focus "on the exploratory/drilling phases", culminating into "Production drilling wells completed". With regard to generation of electricity should the wells prove to hold good potential for exploitation, the PIF indicates that "Also, the production wells, if successful, would already be part of the field development, which is an integral part of the investment costs for a future geothermal power plant". This could lead to the erroneous understanding that the UNDP-GEF project would end after the drilling phase (Phase 2) has been completed. In fact, it would not make much sense for UNDP to end its participation midway through project activities and not to support the Government's efforts to take the project to its logical conclusion of generating base-load electricity from geothermal resources. Hence, to clarify this situation, Component 2 has been reformulated from "Upstream geothermal development preparation" to "Upstream geothermal preparation and development". This brings clarity to the fact that the project will continue all the way through the development of a 10 MW geothermal power plant at Karthala within the 6-year project time-frame.

3. Finally, the PIF indicates that "The idea is to package GEF grant support (earmarked for financial derisking activities) as an (interest-free) reimbursable grant, to be repaid by the developer (an IPP that will be competitively selected) to the Government (possibly as an interest-free loan) in the event the exploratory

drilling leads to a positive decision to move forward with investment in the power plant". Such a modality for converting the GEF grant into "an interest-free loan" has its own merit, but has the inherent disadvantage that it will put an additional burden on potential project developers with regard to credit financing. However, instead of a "reimbursable loan", the PPG recommends that the GEF investment grant to the Comoros geothermal project be computed as "public equity co-investment", making the Government a shareholder of the power plant, together with the private sector investor. Such a public-private sector modality is often utilised in geothermal projects in other countries when the Government or an entity that it supervises participates as a public equity co-investor or shareholder to provide a certain level of financial derisking for the investment to be made by the developer, e.g. Costa Rica, Kenya, El Salvador, etc.

A.1 Project description:

- **Situational Analysis and Development Challenge**

The Union of Comoros is an archipelago island nation in the Indian Ocean, located at the northern end of the Mozambique Channel off the eastern coast of Africa, between Mozambique and Madagascar. The archipelago is comprised of three main islands: Grande Comore (Ngazidja – 52% of the population), Anjouan (Nzwani – 42% of the population) and Mohéli (Mwali – 6% of the population), totalling a land area of 2,034 km^2 and a fourth island, Mayotte, which has been administered by France since 31 March 2011. As per the last census undertaken in 2003, the total population was 576,000 inhabitants; in 2016, it was estimated to be almost 800,000, with approx. 72% living in the rural areas. Comoros is classified as a Small Island Developing State (SIDS) and a Least Developed Country (LDC). Mohéli (Fig. 1) is located some 50 km to the south of Grande Comore, while Anjouan is 60 km to the south-east; just some 600 metres from the coastline, the ocean floor separating the islands makes a sudden sharp drop to 2,000 metres.

Fig. 1: Map of Comoros

The islands have a tropical climate, with two distinct seasons; a hot and humid season with relatively high precipitation from November to April and a dry season from May to October. There is little temperature variation throughout the year, with a max. of 31 deg. C and a min. of 24 deg. C.

- **Country Situation and Development Context**

The main economic activities in the country are agriculture, fisheries, retail and public services. Agriculture represents 34% of the GDP (2016) and consists of the cultivation and sale of food crops such as cassava (tapioca), bananas and coconut intended for self-consumption; some products or their derivatives like vanilla and ylang-ylang are mainly meant for export. As per Government data, the per capita GDP in 2016 was $ 1,411 (654,825 FKM) and the GDP growth rate has been an average of 2%/year over the last few years. Data for 2014 show that almost 35% of the population then lived below the national poverty line. On the Human Development Index scale, the 21 March 2017 UNDP Human Development Report (HDR) ranks Comoros at 160th out of 168 assessed countries.

The primary energy supply in Comoros in 2016 consisted of biomass (in the form of wood, plants and crop residues – 72,020 toe), petroleum products (42,397 toe), electricity (16,553 toe) and renewable energy (78 toe), and their respective share in terms percentages is presented in Fig. 2 below.

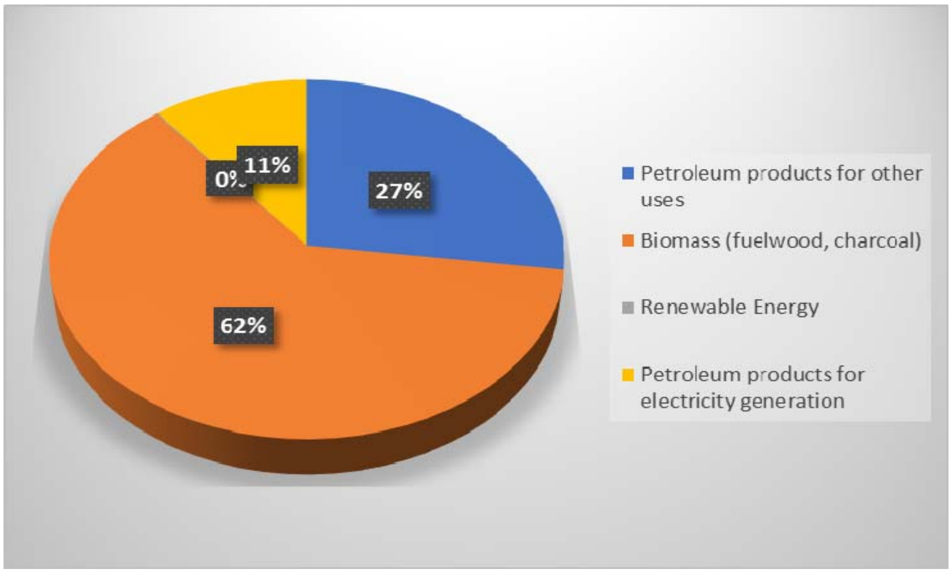


Fig. 2: Primary Energy Supply (2016)

For a more detailed description of the "Situation Analysis and Development Challenge", please refer to the UNDP Project Document (Prodoc), pages 6-17.

A.2. The baseline situation and the problem to be addressed:

- **Electricity Supply**

Electricity in the country is provided by the Government-owned national power company MAMWE (Madji Na Mwendje Ya Komor), which has the mandate to generate, transmit, distribute and market electricity throughout Grande Comore and Mohéli; MAMWE is also responsible for potable water supply on the islands. For Anjouan, electricity services are under the responsibility of the Anjouan Electricity Company (EDA); it is also Government-owned but operates independently of MAMWE.

While access to electricity services in the country is slightly above 50 percent (Grande Comore – 60%, Anjouan - 50% and Mohéli - 20%), the World Bank Country Partnership Strategy (April 2014) notes that "similar to the rest of sub-Saharan Africa, electricity is only available sporadically". Consumers living in the capitals of the 3 islands and in their immediate vicinity receive unreliable electricity supply for most of the day. On the rest of the islands, electricity is supplied for only a few hours a week, if at all. "The main constraining factor to normal service provision is the high cost of imported petroleum products used for power generation. Due to their poor performance in terms of billing and collection, the two Comorian power utilities (MAMWE and EDA) are only able to pay for a portion of their fuel consumption. The corresponding losses are borne by the Société Comorienne des Hydrocarbures (SCH) which in turn finds itself unable to fully pay the State for the taxes collected on fuel. As a result, the energy sector represents a high burden on public finances: it is estimated that total de facto subsidies to the energy sector annually reaches approximately 10 percent of the operating budget of the State. The average electricity tariff (around 33 US cents/kWh - see more below) is high compared to most Sub-Saharan countries, reflecting the economics of a small system with generation based almost exclusively on expensive diesel fuel. Nevertheless, MAMWE is unable to purchase fuel and carry out periodic maintenance on generators". In this connection, it is worth noting that MAMWE and EDA consume approx. 35,000 litres of diesel on a daily basis for electricity generation and the cost of this fuel amounts to $ 20 million/year, representing almost 4% of the country's GDP and a heavy drain on the country's hard currency reserves. Any spikes upward in the presently relatively "low" price of oil can cause a major shock to the country's economy.

Geothermal Energy

Mount Karthala is an active volcano located on Grande Comore at 2,361 m above sea level. It is the southernmost and larger of the two shield volcanoes (named as such for the solidified lava resembling a warrior's shield lying on the ground) on the island, with the second smaller one being the Massif de la Grille located in the northern part of the island - Karthala is somewhat similar to the Mauna Kea, a shield volcano on the Big Island of Hawaii. The Massif de la Grille has not been active for many years now and is not considered to have good potential for geothermal resource exploitation, although its proximity to the Karthala (10 km away) may suggest otherwise. On the other hand, the Karthala volcano is very active, having erupted more than 20 times since the 19th century. Frequent eruptions have shaped the volcano's crater which is 3 km wide from east to west by 4 km wide from north to south. Access to the caldera is by vehicular traffic along a rough terrain for the initial part up to the village of Mvuni and the remaining 15 km from there is presently accessible only on foot. The last lava flow at Karthala was in January 2007, but eruptions have been documented to occur every 11 years, on an average.

A first assessment, made in 2008 as part of a geophysical survey and supported by New Zealand, revealed the presence of an active geothermal reservoir, with the key indicator of a potentially exploitable geothermal resource being the rift system associated with the active volcano that may extend all the way west to Kenya's Great Rift Valley where 636 MW of geothermal energy is presently under exploitation. This first assessment, coupled with subsequent surface exploration around the Karthala basin undertaken with the support of international partners, point towards the potential of ultimately generating some 40 MW of base-load electricity.

Hence, the scope for harnessing the geothermal resource potential resources of Karthala for electricity generation appears very promising, but the bottleneck has been lack of Government resources to complete the studies that would definitely confirm the potential for development. In addition to completing the technical studies, such social issues as land ownership, access to the site, public education about the project, potential benefits to the local community, lower cost electricity supply, etc. need to be assessed. This would also include a strategy for geothermal power development, recognising the facts that any development will put on harbour facilities to bring in heavy equipment from overseas, roads (existing and new) to transport the equipment to the site, local water supplies required during drilling and construction, and availability of competent contractors on the island. Finally, the absence of a clear policy that will promote and facilitate private sector participation in renewable energy development, including that of geothermal energy, acts as a deterrent and needs to be addressed.

- **Barriers to Geothermal Energy Development**

In light of the above and with regard to electricity generation, the Government proposes to utilise the availability of geothermal resources on Grande Comore for base-load grid-electricity generation; this does not exclude utilisation of the abundance of solar energy to supplement electricity generation utilising PV whenever the sun is shining and for thermal water heating. This is in line with the 3 objectives of the Sustainable Energy for All Initiative, viz. to ensure universal access to modern energy services, double the rate of improvement in energy efficiency and double the share of renewable energy in the global energy mix by 2030. Thus, the transformation of the energy sector to an economically viable and environmentally friendly system requires a comprehensive and multi-faceted approach in the design of appropriate policy and institutional frameworks, and incentives to fully integrate geothermal energy (and other renewable energy technologies) into the country's energy mix.

For a more detailed description of the "The baseline situation and the problem to be addressed", including "Barriers to Geothermal Energy Development", please refer to the UNDP Prodoc, pages 22-26.

A.3. GEF Focal area and/or fund(s) strategies, elgibility criteria and priorities:

The project is consistent with GEF-6, CCM-1: Technology Transfer, and Supportive Policies and Strategies, Programme 2: Develop and demonstrate innovative policy packages and market initiatives to foster new range of mitigation actions aimed at reducing GHG emissions. It will promote the market for the utilisation of geothermal energy for base-load electricity generation to supply the electricity grid on Grande Comore.

For a detailed description, please refer to the UNDP Prodoc, Section "Project rationale and policy conformity", and "Country ownership: country eligibility and country drivenness", pages 26-29.

A.4. Stakeholder Analysis and Institutional Framework

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

- **Vice-Presidency responsible for the Ministry of Economy, Planning, Energy, Industry, Handicrafts, Tourism, Investment, Private Sector and Land Development**

The Vice-Presidency responsible for Energy (short form of Vice-Presidency) (Fig.3) has the overall responsibility for formulating, implementing and monitoring policy in the energy sector. In accordance with Decree N°16-095/PR/31-05-2016 that relates to the organisation and functioning of the Vice-Presidency, it exercises its role through the Directorate General of Energy, Mines and Water which, in turn, has supervisory authority over the following Directorates that deal specifically with energy, viz. Directorate of Energy and Mines, Directorate of Renewable Energy, Comoros Geological Authority, MAMWE and EDA (the Directorate of Water and Sanitation only superficially deals with water as it relates to run-of-the-river hydropower generation on Anjuoan and Mohéli).

The electricity sub-sector in the Comoros is managed by two independent legal entities that vertically ensure generation, transmission and distribution: (I) MAMWE is responsible for Grande Comore and Mohéli; and (Il) EDA is in charge of Anjouan since the commencement of the secessionist movement in 1997. It has been reported these 2 entities operate in total independence and this has not encouraged them to practice rigorous management or to develop long-term visions, resulting in inefficient daily management and low recovery rates that have contributed to their poor financial health.

The functions of the Directorate General of Energy, Mines and Water together with those of each of the "energy-related" Directorates under its purview are described below:

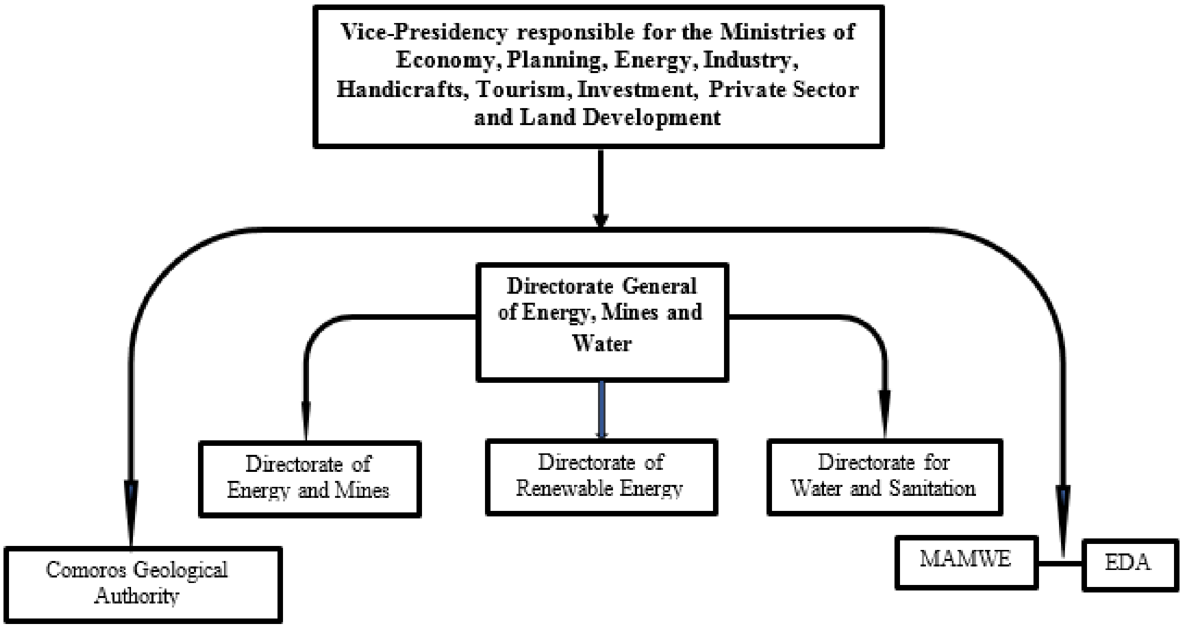


Fig. 3: Organisational Chart of Vice-Presidency responsible for Energy

- **Directorate General of Energy, Mines and Water**

The Directorate General of Energy, Mines and Water is entrusted with the formulation, planning supervision, control, follow-up and coordination of the implementation of programmes and activities of the Government in the sectors of Energy, Sanitation and Mineral Resources. As such, it is responsible for, among others, the following activities (those specifically related to the Energy Sector are managed by the Directorate of Energy and Mines):

- Collect, establish, update and manage a sectoral database for Energy, Water, Mining and Sanitation;
- Commission and supervise the rational development of Energy, Water and Mineral resources over the whole national territory;
- Implement programmes and activities for the optimal development, management governance of these resources within the framework established by the Government;
- Formulate, develop and implement activities related to the rational utilization of renewable sources of energy;
- Provide technical support to regional and community organisations active in the sustainable development, integrated management, protection and development of resources in these sectors;
- Collaborate with national, regional and international, bilateral, multinational organisations as well as with NGOs for coordination of activities in line with national sectoral development plans, within the frameworks of various international conventions to which the country is a party;
- Evaluate the impact of measures implemented by the Government with regard to rational utilization of resources at both the national and regional levels; etc.

- **Directorate of Renewable Energy**

The Directorate of Renewable Energy was established in 2009 and is tasked with the following responsibilities (other than for geothermal energy) under the overall supervision of the Directorate General of Energy, Mines and Water:

- Formulate and implement the Renewable Energy Policy (in draft stage since 2010) of the country.
- Formulate and implement the national strategy aimed at decreasing energy dependence and preserving the environment.

- Promote renewable energy sources such as hydro, solar, wind, biomass and other alternative sources within an institutional framework that is attractive to investors and with a choice of efficient and sustainable technologies for consumers.
- Provide follow-up to all renewable energy projects in the Union of Comoros.
- Contribute to solutions with the objective to eliminating load shedding due to insufficient generating capacity in the country.

- **Comoros Geological Authority (Bureau Géologique des Comores)**

Established on 12 April 2010, the Comoros Geological Authority is an autonomous administrative entity under the direct supervision of the Vice-Presidency responsible for Energy and is entrusted with the following responsibilities specifically related to geothermal energy:

- Formulate and implement national policy with regard to research and development of geothermal energy;
- Propose, formulate and implement the laws and regulations related to mining activities, either alone or in collaboration with other Ministerial Departments;
- Coordinate and promote all geological and infrastructural activities with regard to research and development of geological resources;
- Supervise all geological and related infrastructural activities as they relate to the development of geological resources.

- **MAMWE**

MAMWE, under the direct supervision of the Vice-Presidency responsible for Energy, is responsible for electricity generation, transmission, distribution and sale on Grande Comore and Mohéli, in addition to its functions for potable water supply. On Grande Comore, as indicated earlier, MAMWE has to resort to load shedding almost on a daily basis due to the absence of sufficient generation capacity on the island. In addition, MAMWE has for several years now been plagued by several problems related to, among others, recurring negative commercial performance, outdated equipment and high transmission/distribution/commercial losses. Suffice it to mention that technical losses in the transmission/distribution system, coupled with commercial losses due to electricity theft, absence of proper metering and non-payment of electricity bills result in MAMWE being unable to recover any payment for over 40% of the electricity that it supplies to consumers.

- **EDA**

Like MAMWE, EDA is responsible for electricity generation, transmission, distribution and commercialisation, but only on Anjouan and reports directly to the Vice-Presidency responsible for Energy. EDA was established in 1997 as a response to the secessionist movement on the island. Prior to that, these functions were under the responsibility of MAMWE. The status quo regarding EDA operating independently of MAMWE is likely to be maintained during the coming years in order to avoid a repeat of the pre-1997 events that led to disturbances on Anjouan.

For a more detailed description of the "Stakeholder Analysis and Institutional Framework", including "National Strategies and Plans" and "Baseline Situation and Problem to be addressed" please refer to the UNDP Prodoc, pages 18-24.

A.5. Proposed Alternative Scenario, Expected Outcomes and Components of the Project.

- **Project objective, outcomes and outputs/activities**

The objective of the project is to contribute towards the reduction in the growth of GHG emissions through promoting the development and utilisation of geothermal energy for grid-electricity generation. This objective is proposed to be achieved by putting in place an enabling environment for the development of the country's geothermal energy potential through the participation of the private sector, working closely with village community organisations surrounding the Karthala area. This programme will not only benefit households and small commercial enterprises in that they will enjoy stable electricity services throughout the day without frequent disruptions, but will also connect the private sector, financial and technical training institutions, and local organisations to work together in achieving the country's objectives towards the Sustainable Development Goals.

The project consists of 3 components as outlined below. It is recognised that on-the-job training will be provided by the recruited consultants, both local and international, during the normal course of their support to the relevant project activities and a communication strategy formulated to inform stakeholders on project implementation. In addition, focussed support will be provided during the implementation of Component 2 to capacity development of technical personnel and local specialised engineering workshops for manufacturing any required ancillary supporting equipment and engineering firms in the design, construction, installation, operation, maintenance and repair of equipment that is required for the smooth operation of the geothermal power station.

Furthermore, the project will make it attractive for the private sector to invest in the Comoros geothermal project by shouldering some investment risks through the introduction of certain financial derisking instruments.

Phases of geothermal development at Karthala and estimated costs.

Phase No.	Activity	Duration (Months)	Estimated Cost ($)	Present Status/Funds reqd. ($)
1: Surface Studies	Surface Exploration: Geological Mapping, Geochemical Sampling and Geophysical Surveys.	14 (Oct 2014-Dec 2015)	1,445,000	Completed
2: Exploration Drilling Phase	Environmental and Social Impact Assessment (ESIA).	8 – To be completed before any works commence.	300,000	Funds Required: 45,300,000 Secured Funds (as per co-financing letters: 48,360,000 ,
	Resource Feasibility Study.	3 -To be completed after exploration drilling	600,000	
	Infrastructure for exploration: 8 km of access road + 3,000 m^3 water reservoir.	6	14,900,000	
	Exploratory-cum-production drilling, inclusive of injection wells – 3 wells.	6	26,100,000	
	Front-End Engineering Design (FEED), Contract Prep., Project Mgmt. and Site Supervision.	Over duration of Phase 2. Total Phase 2 duration: 24 months	3,400,000	
3: Power Development and Construction Phase.	Development and land permits, PPA, ESIA (updated for development) (Pre-FID (Financial Investment Decision)).	12	1,100,000	Funds Required: 47,700,000 on the understanding that the 3 wells under Phase 3 will not be required. These funds will come from private sector investors who would be awaiting the results of Phase 2 activities to confirm their participation. *(leveraged finance)*
	Bankable Feasibility Study and Business Plan (Pre-FID).	12	500,000	
	Infrastructure for development	6	3,800,000	
	Production drilling, inclusive of Injection wells -3 wells, if reqd.*	6	25,600,000	
	Steam field development	9	5,500,000	

	Power plant (10 MW)	24	29,600,000	
	Interconnection to MAMWE grid.	12	2,800,000	
	FEED, Contract Prep, Project Mgmt. and Supervision.	Over duration of Phase 3. Total Phase 3 duration: 36 months	4,400,000	
Total Duration /Cost**		**60**		**Total investment: 93,000,000**

**The total duration to complete the drilling and construction phases (Phases 2 and 3) is 60 months; several activities can run concurrently without the need for awaiting the completion of one activity before the next activity can start.

For a more detailed description of "Project Objective, Components, Outcomes, Outputs and Activities", please refer to UNDP Prodoc Section "Project objective, outcomes and outputs/activities", pages 30-39.

A.5.1. Geothermal Systems and GHG Emissions

Geothermal systems are a natural source of greenhouse gas emissions and it may be argued as to whether it makes sense to replace diesel fuel as GHG emitting source with geothermal energy. To address this issue, there have been many studies undertaken to determine the amount of GHG that is emitted when geothermal resources are developed and the findings of some reputable institutions worldwide and active in the geothermal field are presented below.

The US Geothermal Energy Association (GEA) in its 2012 publication entitled "Geothermal Energy and Greenhouse Gas Emissions" states that "Although geothermal power plant emissions arise primarily from existing geothermal resource gases and not from the power generation process itself, research shows that the specific characteristics of the resource, as well as whether the power plant is open versus closed (binary), influences the rate at which those gases are released. Industrial utilization of a geothermal field causes the natural emissions to go from being concentrated in the field to being concentrated in the power plant. Therefore, the technology of the geothermal power plant can also influence the rate at which the gases will be released".

The report goes on to compare geothermal emissions to coal and gas and states that "To put geothermal emissions into context, comparable CO_2 emissions data were obtained from the (US) Environmental Protection Agency (EPA) for coal and natural gas power plants. According to the EPA, the average rate of carbon dioxide emissions for coal-fired power plants and natural gas power plants are 2,249 lbs. CO_2/MWh and 1,135 lbs. CO_2/MWh, respectively. The average rate of emissions for a coal-fired power plant and even a natural-gas-fired power plant are significantly higher than that of a geothermal power plant (at 180 lbs. CO_2/MWh)". With regard to diesel power plants, the average rate of emission is 1,750 lbs. CO_2/MWh, thereby indicating that a geothermal power plant will emit only 10% of CO_2 that a diesel plant of the same capacity output would emit on a per MWh basis.

In conclusion, the report indicates that "most of the published data on geothermal power plant emissions show that these plants emit little carbon dioxide, minute amounts of methane, and little or no nitrogen oxide. Because of these low emissions, the geothermal power plants also meet the most stringent clean air standards. For example, Lake County, California, located downwind of The Geysers geothermal complex, the largest geothermal field in the world, has met all federal and state ambient air quality standards since the 1980s".

There are several other studies that confirm the findings of the GEA. For example, the International Geothermal Conference (IGA) held in Reykjavík, Iceland in September 2003 states that "Geothermal energy is considered to be a benign energy source as regards environmental impact. One of its impacts is the release of the greenhouse gas, CO_2, to the atmosphere. In a recent survey by the IGA it was shown that in comparison with the burning of fossil fuels there is a considerable advantage to using geothermal energy…… The CO_2 emitted from geothermal plants is already part of the CO_2 cycle, no new CO_2 is being produced as is the case in fossil fuel plants". Another example of similar findings is contained in a World Bank paper entitled "Greenhouse Gas Emissions from Geothermal Power Production" by Thráinn Fridriksson et. al. that was presented at the 42^{nd} Workshop on Geothermal Reservoir

Engineering (Stanford University, Stanford, California, February 13-15, 2017) indicates that “GHG emissions from geothermal power production, mostly in the form of CO_2, are generally low in comparison to traditional base load thermal energy power generation”.

In light of the foregoing, all CO_2 calculations that follow have been derated by 10% to account for emissions that may be released into the atmosphere during the normal course of operation of the geothermal power plant.

Project GHG emission reduction impacts

Time-frame	Direct project without replication (30-year equipment projected life).	Consequential post-project (top-down) with replication over next 10 years of project influence and 30-year equipment projected life).	Consequential post-project (bottom-up)
Total CO_2 emissions reduced (tonnes)	1,882,125	43,200,000	5,481,000
Unit abatement cost ($/tonne CO_2)	3.14	0.14	1.08

A.5.2. Geothermal Energy in Comoros: Supplement to or Replacement for Diesel Generation?

There is the fundamental question regarding whether geothermal electricity generation on Grande Comore will supplement diesel generation to meet the increased load requirements over the years or will it at some point completely replace diesel in the electricity generation mix; this issue is discussed below.

The present diesel installed capacity on Grande Comore is 18.8 MW consists mainly of several old diesel generators that suffer from frequent breakdowns, with the result that MAMWE can rely on only 11 MW of firm capacity. The maximum demand on the Grande Comore fluctuates around 15 MW on a daily basis and as the firm capacity is unable to meet the maximum demand, MAMWE has no other option than to resort to load shedding, again on a daily basis. Hence, in order to remedy this situation, it has planned to build an 18 MW heavy fuel power station that is expected to come on line in early 2018. When this happens, MAMWE will retire some of the older diesel machines. Growth in electricity demand is estimated at an average of 5% per annum and MAMWE forecasts that the maximum demand will reach 22 MW by 2025. This should largely be met by the new 18 MW power station, with the contribution of the remaining diesel generators that are still in good operating condition, some of which would also need to be replaced at a later date, after having reached their useful life.

If MAMWE were to go the geothermal route for electricity generation, as proposed under this project, it will have 10 MW of generating capacity coming on line in 2024, and additional 10 MW each in the Years 2026, 2028 and 2030, respectively, providing a total of 40 MW of installed geothermal capacity that will supply the base load. This implies that the available 20 MW of geothermal capacity in 2026 will almost be sufficient to cover Grande Comore’s maximum demand, theoretically necessitating the retirement of most diesel generation on this island. However, it would be wise to still keep some diesel generation to respond to the required peak load demands referred to as the morning and evening peaks and for back-up in case of emergencies. By 2028, when the geothermal generation capacity would have reached 30 MW, geothermal energy would have completely replaced diesel generation on Grande Comore, with spare capacity to cater to future growth. This situation will likely remain unchanged for at least the next 20 years, taking into account the additional 10 MW capacity that can come on line in 2030.

In light of the above, it is clear that geothermal energy will initially only partially replace diesel generation through substitution. However, by 2026, geothermal would have almost replaced diesel generation, with complete replacement of diesel occurring in 2028. This situation will then remain unchanged for the next 20 years.

A.6. Incremental/Additional Cost Reasoning and Global Environmental Benefits

GEF intervention is needed to remove the policy, regulatory, technical, market and other barriers which hamper realisation of the Government plans to harness the Karthala geothermal reservoir to generate base-load electricity to supply the grid on Grande Comore. Electricity from geothermal energy will initially supplement diesel electricity generation and eventually completely replace it, thus saving the country $ 20 million/year in expenditures for diesel fuel. This is expected to create a conducive environment for the private sector to invest in electricity generation from a clean and renewable energy source. Thus, the present project will provide a start to utilising geothermal resources for grid-electricity generation on Grande Comore and this will assist in reducing GHG emissions and improving livelihoods of the population through a reliable and stable supply of base-load electricity that would curtail the present frequent service disruptions that negatively affect economic growth.

By completion of the 6-year project period, a 10 MW geothermal power plant will be operational at Karthala and supplying electricity to the MAMWE grid. Moreover, it is expected that 10 MW of incremental capacity will be added every 2 years until the full expected capacity of 40 MW of the geothermal field is reached. This "staged" development to full 40 MW capacity has the advantage of making early use of the existing wells, thus reducing upfront expenditure and producing revenue to take the project forward.

Over the same 6-year project period, 55,125 tonnes of CO_2 (after a deration of 10% to account for emissions from a geothermal power plant) would have been avoided as a direct result of geothermal power electricity generation. Furthermore, the 10 MW power station will continue avoiding 63,000 tonnes of CO_2 (all subsequent CO_2 figures include the 10% deration mentioned earlier) annually during its remaining 29 years of project life. When one looks at the 30-year lifetime of the geothermal power station earmarked for development during the 6-year project period, the 10 MW power station would have generated 2,390,000 MWh, thus avoiding slightly over 1,882,125 tonnes of CO_2; this is equivalent to $ 3.14 of GEF funds per tCO_2.

Finally, it is assumed that successful implementation of the 10 MW geothermal power station and confirmation of the exploitable resources through drilling of additional wells will enable the total installed capacity of 40 MW to be reached. Thus, the consequential post-project emission reduction estimates related to only the additional capacity amounting to 30 MW over the next 10 years of project influence and 30-year equipment lifetime – on the basis of a GEF causality factor of 80% (top-down approach) -- can be computed at 43,200,000 tonnes of CO_2 avoided, which translates into an abatement cost of $ 0.14 of GEF funds per tCO_2 avoided. In the case of the bottom-up approach, with a replication factor of 3 (in view of the market transformation potential and associated capacity development), the consequential post-project emission avoided are computed to be 5,481,000 tonnes of CO_2, translating into an abatement cost of $ 1.08 of GEF funds per tonne of CO_2 avoided.

For a detailed description of the Incremental/Additional cost reasoning, please refer to the UNDP Prodoc Section 1.4 on "Barriers to Geothermal Energy Development", pages 25-26 and Section on "Cost efficiency and effectiveness" (pages 41-42) that includes GHG calculations.

A.7. Gender Equality and Women's Empowerment.

Elaborate on how gender equality and women's empowerment issues are mainstreamed into the project implementation and monitoring, taking into account the differences, needs, roles and priorities of women and men. In addition, 1) did the project conduct a gender analysis during project preparation (yes ☒ /no☐)?; 2) did the project incorporate a gender responsive project results framework, including sex-disaggregated indicators (yes ☒ /no☐)?; and 3) what is the share of women and men direct beneficiaries (women 50%, men 50%)? [1]

Gender will be mainstreamed in all the activities planned by the project. To facilitate such action, a gender expert will be part of the Project Board, members of the Project Management Unit will receive training on gender mainstreaming and be supported periodically by a gender expert.

[1] Same as footnote 8 above.

The development and operation of the geothermal power plant is expected to be male-dominated because women are generally absent from sectors considered too technical and that require heavy capital investments. However, even without the technical know-how, business-women can recruit engineers in their team and participate to provide technical services during implementation of the geothermal power project; hence, women entrepreneurs will be strongly encouraged to apply for the provision of these services. In addition, the Comoros Geological Authority will be encouraged to recruit women engineers to participate in the project and emphasis will be placed on including as many women as men, and particularly tailoring some of the training to recent high school and college graduates, a group that has a higher presence of young women in the country.

For a more detailed description of the "Gender Equality and Women's Empowerment", Please refer to page Section "Mainstreaming gender" on page 40 of Prodoc and "Social and Environmental Screening Template", Annex F of Prodoc.

A.8 Risks. Elaborate on indicated risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, the proposed measures that address these risks at the time of project implementation.

Project Risks					
Description	**Type**	**Probability & Impact**	**Mitigation Measures**	**Owner**	**Status**
Political Conflict: The project will need long-term commitment such as conducive environment for private sector participation in the electricity sub-sector. With the high turnover at the highest level of Government, with several putsches in the recent years, these commitments may not be fulfilled.	Political	P=3 I=3	UNDP has played and will continue to play a key role to assist in resolving the political crisis that can feed into any civil unrest. UN Security continuously monitors the country situation and implements adaptation strategies as warranted by events on the ground. The country situation will be closely monitored by the UNDP Country Office, which will support implementation of the project and its inputs/advice will be sought on the security situation whenever warranted. Also, community involvement and consultation will be an integral part of project activities in order to ensure civil society buy-in and minimize the risk of conflict escalation and other potential tensions.	UNDP CO	No change
Policy: The success of this project will be determined to a large degree by adoption and effective enforcement of the proposed policies. Lack of political support may jeopardise the achievement of immediate results and overall impact.	Operational	P=2 I=3	There exists the possibility that the Government may not act soon enough on a policy framework that will encourage the private sector to invest in the development of geothermal resources for base-load grid-connected electricity generation; in this regard, the absence in the Electricity Code of the accompanying guidelines and procedures for private sector participation in the electricity sub-sector has proved to be a bottleneck. However, the Government is strongly motivated to reduce its foreign currency expenditures for diesel fuel through utilisation of locally-available geothermal resources to provide stable and efficient electricity services to the population to	UNDP CO	No change

			improve their quality of life and for income-generating activities, and is driven by its plans to meet the Sustainable Development Goals. Towards this end, it plans to rectify these shortcomings through the forthcoming Energy Code, thus sending the right signal to stakeholders. The donor community, including AfDB, EU and the World Bank, has been/is working with the Government to have the right policy for the electricity sub-sector. Moreover, project interventions under Component 1 will assist in mitigating this risk.		
Geothermal Resource Availability: Explorations may reveal that no utilisable resource is available.	Operational	P=3 I=5	Preliminary results so far have led to an estimation of the potential of the geothermal reservoir to be approx. 40 MW, and possibly more. Recent surface explorations have further confirmed the geothermal resource. The uncertainty now remains only on how to best harness the resource, which is one of the objectives of this project.	UNDP CO	No change
Lack of Investor Appetite: Comoros ranks in the 153rd place among 190 countries in "Ease of doing Business", as per the WB/IFC publication "Doing Business 2017".	Operational	P=4 I=5	The fact that Comoros ranks in the 153rd place among 190 countries in "Ease of doing Business", as per the WB/IFC "Doing Business 2017" publication might act as a deterrent for investors in geothermal resources development, although this may not have tempered the willingness of some of them to invest in other sectors of the economy in the country. With this in mind, the project will implement financial derisking activities under Component 1 that will be directed at minimising the financial risks that lenders and investors alike may face in doing business targeting geothermal power development for grid-connected base-load electricity generation. This risk will be further mitigated under Component 2 through a derisking grant labelled as "public equity co-investment" that would accrue to the Government, making it a shareholder of the geothermal power plant when it is built.	UNDP CO	No change
Technology: Geothermal technology might be too advanced in a country like	Operational	P=4 I=3	Geothermal energy development being a new field in Comoros, it is highly likely that project developers will build partnerships with international partners to benefit from the latter's experience with and exposure to	UNDP CO	No change

Comoros.			geothermal power development for electricity generation in developing and developed countries. At the same time, the local operators will benefit from capacity development provided by these international partners.		
Climate: Climate change may tend to cause changes in and increase the variability of Comoros rain patterns. This may cause floods or mud flows at Mount Karthala that hosts the volcano and that will be the site for the power station.	Operational	P=3 I=3	There are multiple environmental risks, as outlined in Comoros's Second National Communication to UNFCCC, e.g. reduced rainfall that can affect the water table, land degradation due to erosion and population pressures, etc. This risk will be mitigated through capacity development of Government staff on the key aspects to address national challenges associated with weather, climate and climate change. In addition, proper criteria and safeguards will be developed for each intervention (exploration, drilling, exploitation, etc.) on Mount Karthala to take into account potential extreme climate change-driven events, such as floods, mud flows and drought.	UNDP CO	No change
Geological risk: Geothermal development is always associated with the risk of eruption, accompanied by environmental and social risks.		P=3 I=3	Exploitation of geothermal resources often acts as a "pressure release valve" by channelling the energy build-up in the magma in a controlled manner for electricity generation. This, in turn, can decrease the frequency of eruptions. The project will ensure that proper and adequate environmental and social safeguards are taken into account during project implementation. This is in line with UNDP's policy on Social and Environmental Screening.	UNDP CO	No change

A.9. Institutional Arrangement and Coordination.

The project will be implemented following UNDP's National Implementation Modality, according to the Standard Basic Assistance Agreement between UNDP and the Government of the Union of Comoros. The Government (Vice-Presidency responsible for Energy) will appoint a National Project Director who will assume overall responsibility for project implementation, ensure the delivery of project outputs and the judicious use of project resources. The National Project Director will be assisted by a Project Management Unit headed by a Project Manager (PM) to be recruited through a competitive process. The PM will be responsible for overall project coordination and implementation, consolidation of work plans and project activities, preparation of quarterly progress reports, reporting to the project supervisory bodies and supervising the work of the project experts and other project staff. The PM will also closely coordinate project activities with relevant Government and other institutions and hold regular consultations with project stakeholders. An international part-time Chief Technical Adviser (15 weeks/year) will be recruited to support the PM on technical issues, while a full-time Project Assistant (PA) will support the PM on administrative and financial matters.

For additional information on "Stakeholder Participation", please refer to UNDP Prodoc, Section "Governance and Management Arrangements", pages 57-61.

Additional Information not well elaborated at PIF Stage:

A.10 Benefits.

(a) Technical Benefits: From a technical point of view, the viability of geothermal resources for base-load electricity generation to supply the grid has been demonstrated over the years in several developed and developing countries, including some located in Africa, e.g. Ethiopia and Kenya. In addition to Comoros, other countries in Africa like Réunion Island, Tanzania, Uganda and Zambia have or are embracing geothermal energy development to supply electricity to their individual grids. By addressing the non-technical barriers that impede the development of geothermal energy in Comoros, the project will assist in creating a sustainable niche through strengthening the policy, institutional, legal, regulatory and operational capabilities of the key national institutions, supporting the development of the technology through a market-driven approach, developing national capabilities and disseminating information. These efforts should ensure the sustainability of geothermal-based electricity generation in the country for, at least, the next 40 years.

(b) Financial Benefits: From a financial point of view, the project will bring in private sector funding and support the integration of local manpower and industries into the geothermal energy sector. This will be achieved on one hand through the provision of financial incentives to the project developers and, on the other hand, through focused capacity development of technical personnel and local specialised engineering workshops for manufacturing/maintaining the required ancillary supporting equipment and engineering firms in the design, construction, installation, operation, maintenance and repair of electro-mechanical equipment.

(c) Socio-economic Benefits: The project fully endorses the human rights-based approach and will not lead to any adverse impacts on enjoyment of human rights (civil, political, economic, environmental, social or cultural) of any key or potential stakeholders, communities involved or the population at large.

The coming on line of the geothermal power station will provide a stable and efficient supply of electricity in the country and enable the population to embark upon electricity-based income-generating activities that can improve their livelihoods. In addition, the utilisation of geothermal energy for electricity generation, in lieu of imported fossil fuel, will reduce the country's GHG emissions and contribute to a safer and healthier environment for the population at large. In doing so, capacity development for electricity consumers will emphasise the importance of best practices in energy management and the use of energy efficient devices such as turning off on lights/radios/TVs when not in use, use of LEDs for lighting, utilisation of energy efficient appliances/motors, etc.

Some of the long-term benefits include: A stable and efficient supply of electricity will provide opportunities for households, mainly women, to pursue income-generating activities requiring an electricity service and extend the hours of school children for homework; Provision of electricity (a clean and smokeless fuel), instead of candles and kerosene, for lighting will assist in eliminating respiratory/eye problems associated with exposure to smoke and reducing all too frequent accidental house fires; some 200 jobs created in the geothermal power sector and 2,000 jobs related to income-generating activities.

(d) Environmental Benefits: Comoros will draw upon all its strategies for addressing climate change to systematically mainstream climate change considerations into geothermal power development. This will assist decision-making on energy infrastructure and service delivery options to take into account the uncertainty associated with climate change predictions and to assess the climate resilience of different options. The project will ensure that the agencies tasked with the country's climate change portfolio are actively engaged in the project coordination mechanism so as to promote an integrated approach.

The project will have a direct positive effect on environmental sustainability, as the primary objective of the project is to accelerate utilisation of geothermal technology for the global good of the population. This will be beneficial to both the country's economy and to the global environment, through the reduction of greenhouse gas emissions. In this context and as indicated earlier, by completion of the 6-year project period, 55,125 tonnes of CO_2 would have been avoided as a direct result of geothermal power electricity generation. Furthermore, the 10 MW power station will continue avoiding 63,000 tonnes of CO_2 annually during its remaining 29 years of project life.

(e) Replicability

The Project's potential for replicability within the country is very limited as Mount Karthala is the only active volcano in the country that holds a good promise for being exploited for grid-connected base-load electricity generation. The project will adopt a bottom-up approach within the overall policy/investment framework that is envisaged to be developed to promote geothermal development for on-grid electricity generation and expansion to fully utilise Karthala's potential resources. Technical assistance for barrier removal and institutional strengthening to be provided under the project will facilitate the development of the required institutional, policy and technical conditions to enable the generation of renewed investor interest for the development of additional capacity at Karthala over the next few years. Moreover, the lessons learned will be of great value to the SIDS countries that share a similar resource base and have plans to tap into their respective geothermal potential for electricity generation.

(f) Scaling Up

As indicated earlier, the initial geothermal capacity of 10 MW to be installed on Grande Comore is expected to be followed by the incremental addition of 10 MW every 2 years until the total potential capacity of the geothermal reservoir of 40 MW is reached. This initial capacity of 10 MW presents a huge potential for scaling up, utilising a sound business model involving a robust financial modality, coupled with an effective awareness/outreach programme, that will encourage private sector participation to increase the installed capacity to the full 40 MW. This, in turn, will enable the Government to utilise a clean and renewable energy source to generate electricity, to provide a more efficient and reliable electricity service to the population, in contrast to the present situation that involves power cuts on a daily basis that negatively affect economic growth and considerably reduce its foreign currency expenditures for the purchase of imported diesel fuel.

A.11 Knowledge Management.

UNDP has a strong role to play as knowledge broker, capacity development supporter and partnership facilitator when developing countries work together to find solutions to common development challenges. This UNDP-GEF project will support South-South and Triangular Cooperation (SSTrC) through cooperation modalities that will involve bi-lateral knowledge exchange on implementation procedures and technology transfer. Towards this end, UNDP will facilitate interaction between Comoros and other countries where it has participated in geothermal development for electricity generation like, for example, Costa, Ethiopia, Honduras and Kenya. and where geothermal power plants are already generating electricity. In addition, collaboration will be sought with other countries in Africa, Asia, Latin America and the Caribbean where similar geothermal projects have been implemented or are proposed for implementation. For example, St. Lucia is planning to develop a 30 MW geothermal power station and activities there are approx. at the same stage as those in Comoros; this will provide for very useful collaboration between these two countries, especially in view of the fact that New Zealand is supporting both projects. Similar geothermal development activities are proposed in other SIDS countries like Dominica, Fiji, Guadeloupe, Réunion, Vanuatu, etc.

In addition to this South-South Cooperation that will involve knowledge exchange on implementation procedures, technology transfer and lessons learned/best practices, the project will present private sector developers with opportunities to associate themselves with international partners to benefit from the latter's experience and exposure in similar markets outside Comoros.

B. DESCRIPTION OF THE CONSISTENCY OF THE PROJECT WITH:

B.1 Consistency with National Priorities.

National Energy Policy

The Government has yet to formulate a National Energy Policy that would include both conventional as well as renewable sources of energy. However, conscious of the fact that it disburses $ 20 million annually on imported fuel for electricity generation, the Government wants to privilege development of renewable sources of energy both to meet the base load and the morning/evening peaks. It is in this context that it wants to develop the Karthala geothermal resources for base-load electricity generation to replace imported diesel fuel, without disregard for utilising other sources of renewable energy, where feasible. In doing so, it is motivated by its desire to improve the quality of life of the population through the increase in the electricity access level and to ensure energy independence in security of energy supply through the development of locally-available energy resources through public-private partnerships and participatory approaches.

National Energy Strategy

In the absence of a National Energy Policy, the Government solicited the support of the European Union to prepare a National Energy Strategy for the next 20 years. This document entitled "Elaboration d'une stratégie sectorielle nationale Energie aux Comores – Strategie Sectorielle à 20 ans" was issued in January 2013 and covers the period 2013 - 2032. It is a comprehensive document that deals with the various energy sub-sectors, viz. traditional energy (wood and charcoal, as they relate to forestry management), fossil fuels, electricity generation and supply, and energy management. It also outlines the main parameters that should constitute a National Energy Strategy and defines its main and operational level specific objectives.

The main objective of the National Energy Strategy is to "contribute to the country's sustainable development path through the provision of energy services that are affordable to a larger segment of the population, at least cost and that promote socio-economic activities". At the operational level, the specific objectives are, among others, to (i) reduce the country's dependence on imported fossil fuels for electricity generation and transport and (ii) provide access to energy services". The National Energy Strategy also calls for improving the institutional, legal and regulatory framework for the energy sector, with due consideration being given to the environmental impacts associated with energy development and utilisation.

For additional information on "Consistency with National Priorities", please refer to UNDP Prodoc, Section "National Strategies and Plans", pages 21-24.

C. DESCRIBE THE BUDGETED M &E PLAN:

The Monitoring and Evaluation (M&E) Work Plan and Estimated Associated Budget are presented in the Table below:

GEF M&E requirements	Primary responsibility	Indicative costs to be charged to the Project Budget[2] (US$)		Time frame
		GEF grant	Co-financing	
Inception Workshop	UNDP Country Office	5,000	5,000	Within two months of project document signature
Inception Report	Project Manager	None	None	Within two weeks of inception workshop
Standard UNDP monitoring and reporting requirements as outlined in the UNDP POPP	UNDP Country Office	None	None	Quarterly, annually
Monitoring of indicators in project results framework	Project Manager	12,000	12,000	$ 4,000/year carried out annually
GEF Project Implementation Report (PIR)	Project Manager and UNDP Country Office and UNDP-GEF team	None	None	Annually
NIM Audit as per UNDP audit policies	UNDP Country Office	15,000	15,000	Annually or other frequency as per UNDP Audit policies -$ 3,000/year
Lessons learned and knowledge generation	Project Manager		3,000	Annually
Monitoring of environmental and social risks, and corresponding management plans as relevant	Project Manager UNDP CO	None	3,000	On-going
Addressing environmental and social grievances	Project Manager UNDP Country Office BPPS as needed	None for time of project manager, and UNDP CO	None	
Project Board meetings	Project Board UNDP Country Office	None	3,000	At minimum, annually

[2] Excluding project team staff time and UNDP staff time and travel expenses.

GEF M&E requirements	Primary responsibility	Indicative costs to be charged to the Project Budget[2] (US$)		Time frame
		GEF grant	Co-financing	
	Project Manager			
Supervision missions	UNDP Country Office	None[3]	4,000	Annually
Oversight missions	UNDP-GEF team	None[3]	4,000	Troubleshooting as needed
Knowledge management as outlined in Outcome 4	Project Manager	26,450	None	On-going – to be covered as part of project fees
GEF Secretariat learning missions/site visits	UNDP Country Office and Project Manager and UNDP-GEF team	None	None	To be determined.
Mid-term GEF Tracking Tool to be updated by (add name of national/regional institute if relevant)	Project Manager	10,000	5,000	Before mid-term review mission takes place.
Independent Mid-term Review (MTR) and management response	UNDP Country Office and Project team and UNDP-GEF team	25,000	5,000	Between 2nd and 3rd PIR.
Terminal GEF Tracking Tool to be updated by (add name of national/regional institute if relevant)	Project Manager	10,000	5,000	Before terminal evaluation mission takes place
Independent Terminal Evaluation (TE) included in UNDP evaluation plan, and management response	UNDP Country Office and Project team and UNDP-GEF team	40,000	5,000	At least three months before operational closure
Translation of MTR and TE reports into English	UNDP Country Office	10,000	5,000	
Total indicative cost, excluding project team staff time, and UNDP staff and travel expenses		153,450	74,000	

[3] The costs of UNDP Country Office and UNDP-GEF Unit's participation and time are charged to the GEF Agency Fee.

PART III: CERTIFICATION BY GEF PARTNER AGENCY(IES)

A. GEF Agency(ies) certification

This request has been prepared in accordance with GEF policies[4] and procedures and meets the GEF criteria for CEO endorsement under GEF-6.

Agency Coordinator, Agency Name	Signature	Date (MM/dd/yyyy)	Project Contact Person	Telephone	Email Address
Adriana Dinu UNDP-GEF Executive Coordinator		12/22/2017	Saliou Toure, Regional Technical Advisor, EITT	+90 850 288 2648	saliou.toure@undp.org

[4] GEF policies encompass all managed trust funds, namely: GEFTF, LDCF, SCCF and CBIT

ANNEX A: PROJECT RESULTS FRAMEWORK

An abridged version of the logframe is provided below. However, a complete version can be found in the GEF-UNDP project document.

	Indicator/ *Sub-Indicator*	Baseline	Targets Mid-Project	Targets End of Project	Sources of Verification	Risks and Assumptions
Objective						
To promote geothermal energy resource development in the country for base-load electricity generation.	Emission reduction (in tCO_2 over 30-year plant economic lifetime). Investment in electricity generation from geothermal energy. Capacity installed (MW) and annual energy produced (MWh) by Geothermal Power Station(s). Number of jobs created. Number of beneficiary households and enterprises countrywide.	GHG emissions in the country was 995,354 tCO_2 and with the implementation of remedial measures, including the development of geothermal energy for electricity generation is forecasted to be reduced by 84% by 2030 (Source: INDC) The present contribution of geothermal energy for electricity generation is non-existent. No investment taking place in electricity	Surface exploration completed. Streamlined policies and strategies in place. Exploratory-cum-production wells, front-end engineering design and contract preparation completed. Bankable feasibility study and business plan under preparation. 800 jobs created.	10 MW of geothermal capacity installed, resulting in almost $ 46 million in investment for Phase 2 and the further $ 47.7 million for Phase 3. Geothermal-based electricity generation of 80,000 MWh/year. Reduction of 63,000 tonnes of CO_2/year over the 30-year lifetime of the geothermal power station. Estimated cumulative consequential post-project (bottom-up) GHG emission reduction of	Project's annual reports, GHG monitoring and verification reports. Project mid-term review and terminal evaluation reports.	Continued commitment of project partners, including Government agencies and investors/developers.

	Indicator/ *Sub-Indicator*	Baseline	Targets Mid-Project	Targets End of Project	Sources of Verification	Risks and Assumptions
		generation from geothermal energy.		5,481,000 tonnes of CO_2 during the equipment lifetime, applying a replication factor of 3. An additional 1,400 jobs created.		
Outcome 1: Streamlined and comprehensive market-oriented energy policy, legal/regulatory framework and financial instruments for geothermal energy based power plants.	Policies and strategies for geothermal power development approved and operational	Not available at the present time.	Completed and approved by Government within 12 months of project initiation.	Already completed.	Project documentation.	Commitment of Government entities.
Outcome 2: Geothermal resource availability is assessed, established and 10 MW power station is operational.	Evidence that a 10 MW geothermal power plant has been built and is operational	Not available at the present time.	Exploratory-cum-production wells, front-end engineering design completed.	Completed by the end of Year 5 of project initiation.	Project documentation.	Cooperation of all stakeholders.

	Indicator/ *Sub-Indicator*	Baseline	Targets Mid-Project	Targets End of Project	Sources of Verification	Risks and Assumptions
Outcome 3: Increased awareness about geothermal potential and investment climate.	Public relations and investment promotion programme defined, approved and rolled out	Lack of sufficient information to attract investors.	Completed within 24 months of project start.	Already completed.	Project reports and website.	Growth of programme will be sustained.

ANNEX B: RESPONSES TO PROJECT REVIEWS

Comment	Response	Reference in Prodoc
France comments		
1. Estimated installed capacity of Comoros Islands is 22 MW, of which only 8 MW are actually available. The main reason given is that the power distribution system is outdated, poorly maintained and managed. An 18 MW heavy Fuel Oil fired plant is planned, and later this geothermal power plant. It is of utmost importance that energy efficiency and rehabilitation of the distribution network is first carried out and implemented. This will strongly impact and influence the economic interest of future renewable energy projects.	Rehabilitation of the transmission, distribution and commercialisation of electricity is being implemented hand-in-hand by AfDB and WB, with the construction of the new 18 MW heavy fuel oil power station. Without these activities being implemented, it does not make any economic and commercial sense to keep on adding generation capacity.	Page 20.
2. Development of renewable energy sources is good to reduce or avoid any new fossil fuel fired plants. A prerequisite is that a favourable regulatory, legislative and policy framework is developed and implemented. Hence the importance of component 1 of the project. However, the confirmation of potential geothermal energy resources is a long process, and may take at least 5 years before power production. It is advised to check whether solar energy system (PV or CSP) would not be preferable and less risky than geothermal energy.	During the PPG, an economic and financial analysis was undertaken to determine, on an LCOE basis, which renewable energy source would provide the best alternative to supply MAMWE with base-load electricity in replacement on diesel fuel in the long term. This analysis shows that tapping Karthala's geothermal reservoir for electricity generation would provide the best option. Preliminary studies (surface exploration) indicate a good geothermal resource potential. However, this needs to be confirmed by drilling and, in case of positive results, the next step would be the actual construction of a 10 MW geothermal power plant. Yes, this whole process will take 5 years to complete and the sooner it starts, the better for the country that spends $ 20 million/year on the purchase of imported diesel fuel.	Page 31. Pages 8 and 32.
3. Geothermal energy production is a very risky and a highly capital-intensive industry which is a major barrier to attract private investors. Particularly if we consider that the market (Grande Comore) is quite small. Such industry can only be developed through public commitments and investments with a strong	Risk is always balanced with benefit and geothermal development is no exception. It is capital-intensive, but the LCOE analysis shows that it is the most viable option, both economically and financially. To date, there has been strong support from both the Government and several donors. In addition, there is interest to invest from the private sector, should the	

support from donors.	drilling show promising results.	Page 32.
4. Geothermal energy is climate-friendly but can entails strong negative environmental and social issues (H_2S emissions, noise, displacement of indigenous people, modification of landscapes, possibly GHG emissions). In addition, open land spaces are limited in small islands.	The geothermal power station will be up in the mountain and some 10 km away from the closest villages; hence, noise pollution for them will be minimal. However, there will be some CO_2 emitted and studies in other countries have shown that a geothermal power station emits 10% of the CO_2 that is emitted by a diesel power station. Consequently, avoided GHG emissions through the utilisation of geothermal energy have been derated by 10%.	Page 29.

Germany comments		
1. Who will be in charge of operating the geothermal plant (assuming it moves to the construction stage) and ensuring its maintenance? The State-run utility is described as severely lacking capacity. Will MA-MWE be in charge of running this plant or would it remain in the hands of a private developer?	The geothermal power plant will be developed, operated and maintained by the private sector developers, likely a private sector consortium. The private sector will sign a long-term PPA with MAMWE for the sale of electricity to its grid.	Pages 24 & 29
2. Given the significant risks cited for the geothermal project, e.g. a hard-to reach-site that has no road or water access for drilling, risk of volcanic eruptions, an advanced technology that greatly exceeds local capacities, significant costs ($80 million if the project makes it through to construction), please provide an explanation as to why other RE technologies were not given preference, i.e. solar? Could a cost comparison be made to see how much solar could be installed for the equivalent amount of money, i.e. $ 80 million? It also seems improbable that the wind potential is so low and a feasibility study should probably be carried out.	During the PPG, an economic and financial analysis was undertaken to determine, on an LCOE basis, which renewable energy source would provide the best alternative to supply MAMWE with base-load electricity in replacement of diesel fuel in the long term. This analysis shows that tapping Karthala's geothermal reservoir for electricity generation would provide the best option. With regard to wind energy, very little direct measurement data is available that can validate the potential for utilising wind energy in the country. A study financed by the European Union in 2012 estimated, through extrapolation of data at the "meteorological height" of 10 metres, that the average wind speed at a height of 50 m would be slightly above 5 m/s, but this was never validated through actual measurement. However, a wind map for the whole of Africa prepared jointly by the Agence Française de Développement (AFD) and the African Development Bank (AfDB) in 2009 indicates an average wind speed of 4 m/s at a 50-m height for Comoros. Be that as it may, a wind speed of 4-5 m/s at a hub height of 50 m does not lend itself for bulk electricity generation from wind. However, there may be certain sites high up in the mountains, especially on Grande Comore, where the average wind speed could be higher at 50 m height	Page 14 Page 13

	(the minimum hub height of a wind electricity generator) and these could potentially be used for installing wind generators. Hence, it might be worthwhile to initiate a serious study to determine the wind power potential of the country to ascertain the share of wind energy, if any, in the country's energy mix for grid electricity generation.	
3. How does the proposed geothermal plant of 10 MW fit in with the planned construction of the 18 MW heavy-oil power plant? What are total energy demands for Comoros?	The proposed 10 MW geothermal power plant will initially supplement diesel generation with the installation of 10 MW. However, with the addition of increments of 10 MW every 2 years until the total installed capacity of 40 MW is reached, diesel power generation will be totally eliminated from the Grande Comore landscape by 2028, after 30 MW of geothermal would be operational. Another 10 MW of geothermal can be added depending on requirements to cater for future growth over the next 20 years beyond 2028. The 18 MW heavy fuel power station will remain as stand-by to cater for emergency situations. The maximum demand on Grande Comore fluctuates around 15 MW on a daily basis and as the firm capacity is unable to meet the maximum demand, MAMWE has no other option than to resort to load shedding, again on a daily basis.	Pages 29 Page 24
Why is more focus not placed on improving the efficiency of the currently installed 22 MW of power plants, which only deliver 8 MW?	The main reason why the available capacity of the presently-installed diesel generators has to be downgraded from 18.8 MW to 11 MW is because of the old age of the equipment that results in very frequent breakdowns. There is absolutely no way that the life of these "old work horses" can be extended or their efficiency improved; simply put, they have almost reached their useful life.	Page 29
It seems like the installation of the 18 MW heavy-oil power plant would not permit the country to meet its emissions reductions targets set out in the INDC.	It is true that installation of an 18-MW heavy fuel power station will make it difficult for the country to meet the country's INDC targets. However, Comoros recognises the fact that it could hinge on an 84% emission reduction through the development and utilisation of geothermal energy. That is the reason why the Government seriously considers, in its INDC, geothermal energy as the option to meet the country's commitment for GHG emission reduction.	Page 23
Could GEF, UNDP and other project partners condition their support upon stopping the construction of the heavy-oil power	The 18 MW heavy fuel power station is still scheduled to come on line in the future, even with significant delays. There are still a lot of debate at	Page 29

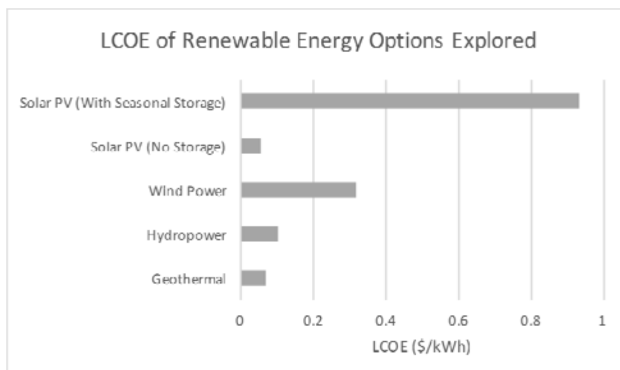
plant?	national level for pros and cons of the plant. However, constructions are slowly on-going. If construction of the plant was to stop right now, there would be no short-term option to meet the electricity demand on Grande Comore until the proposed geothermal plant were to come on line in 5-6 years from now. As the maximum demand is already heavily suppressed, the more the delay in bringing additional capacity on line, the more of load shedding will need to be resorted to, resulting in tremendous hardship to the population.	
4. Does the 1.5 million tonnes of CO_2 savings over the 30-year lifetime assume that the geothermal plant is replacing a fossil fuel plant? Germany would like to seek clarification on how this figure was calculated.	Geothermal power generation will completely replace diesel by 2028, with spare capacity to cater to future growth. This situation will likely remain unchanged for at least the next 20 years, taking into account the additional 10 MW capacity that can come on line in 2030. In addition, calculations show that over the 30-year lifetime of the geothermal power station earmarked for development during the 6-year project period, the 10 MW power station would avoid 1,882,125 tonnes of CO_2, slightly above the initially forecasted figure of 1,500,000 tonnes of CO_2.	Page 29 Page 40

RESPONSES TO STAP RECOMMENDATIONS

Comment	Response	Reference in Prodoc
1. An 18 MW heavy fuel oil-fired power plant is planned to add to the total current generation capacity of 22 MW. The issues of high energy losses through transmission and fraud are not considered here but need addressing.	Generation, transmission, distribution and commercialisation issues are being/have been addressed with the support of AfDB and WB.	Page 20.
2. The potential GHG emissions avoided as presented in the proposal seems to assume existing thermal plant would be displaced. In reality, any built new RE electricity generated is likely to be used to meet growing demand rather than to displace existing diesel-plant generation. When assessing the mitigation costs of \$/t CO_2 avoided, the CO_2 emissions coming from geothermal resource extraction must be taken into account as they can reach 10-50g/kWh depending on the ground source conditions. The argument in the proposal	Geothermal energy will initially supplement diesel generation by partially substituting for it. However, by 2026, geothermal would have almost replaced diesel generation, with complete replacement of diesel occurring in 2028. This situation will then remain unchanged for the next 20 years. Studies have shown that a geothermal power plant will emit only 10% of CO_2 that a diesel plant of the same capacity output would emit on a per MWh basis. Hence, avoided GHG emissions through utilising geothermal energy have been derated by	Page 30.

should therefore justify that geothermal plant would avoid future emissions if new oil-fired or diesel-fired plant were developed instead.	10%.	Page 29.
3. This geothermal proposal in itself is worthy of support and would normally receive STAP consent. However, STAP raises concerns that the use of GEF resources to support more solar PV systems being developed could be justified before further exploration and development of geothermal sources, or other possible RE options.	Other renewable energy options (solar, wind, biomass) were reviewed and an LCOE analysis was undertaken. The analysis shows that for base-load power, geothermal is the least cost option.	
4. It Is agreed that the potential for mini-hydro appears limited and wind is constrained if the mean annual wind speed is only around 5m/s as stated, though this seems low for an island and investment in wind monitoring masts would be warranted to accurately assess the wind resource. However, the solar resource at 6kWh/m2/day is very good and solar PV systems could be quickly developed compared with geothermal that will take at least 5 years before any electricity is generated.	There are no rivers on Grande Comore. With regard to wind, a wind map for the whole of Africa prepared jointly by the Agence Française de Développement (AFD) and the African Development Bank (AfDB) in 2009 indicates an average wind speed of 4 m/s at a 50-m height for Comoros; such a low wind speed does not lend itself for bulk electricity generation from wind. However, there may be certain sites high up in the mountains, especially on Grande Comore, where the average wind speed could be higher at 50 m height (the minimum hub height of a wind electricity generator) and these could potentially be used for installing wind generators. Hence, it might be worthwhile to initiate a serious study to determine the wind power potential on all 3 islands of the country to ascertain the share of wind energy, if any, in the country's energy mix for grid electricity generation. Solar PV will be a good addition to the energy mix and, together with battery storage, will assist in meeting the daily peak loads. However, for base-load electricity generation, geothermal offers a more cost-effective solution.	Pages 13-14.
5. The question that has to be asked is whether the investment for geothermal exploration, plus around $50M in plant construction costs to total $81.3M, would be a better value proposition for the GEF and co-funders than a similar level of investment made in solar PV. The current proposal does not assess this comparison nor adequately justify funding geothermal above solar PV.	As indicated earlier, an LCOE was undertaken and it shows geothermal for base-load electricity generation to be the more cost-effective solution.	
6. Assuming a cost of $6/W installed for PV, if the total $81.3M investment cost proposed for this 10 MW geothermal exploration project was instead used to support solar PV, around 14MWp of PV could be installed. Assuming a conservative capacity factor of	Based on the techno-economic analyses made during the PPG phase, it was found that grid-connected solar PV is indeed more cost-effective than geothermal, and that the same capital expenditure has the potential to yield a greater installed capacity. However, this does not fully compare the two	Annex H of the ProDoc

20% this would generate around 24 GWh per year. (It is assumed that the 3600 GWh total solar generation potential quoted in the proposal is the total technical potential though it is not clear what assumptions were used to calculate this). Given the planned future geothermal development based on the projected exploration outcomes is for 10MW, that equates to around $8/W, but with an assumed capacity factor of 70% (this is not quoted in the proposal), this would generate around 60 GWh/yr.	technologies. To replace 10MW of geothermal energy with solar PV requires for the latter to deliver the same quality of power i.e. firm power. To achieve this, such a solar PV project would have to include vast amounts of storage, which when integrated into the techno-economic analysis showed that the LCOE of this proposal was the least competitive of all options explored.	
7. This grid is poorly maintained so will also probably need to be upgraded to carry the additional load adding further to the total cost. Users of the additional electricity would be the residents, schools, hospitals and businesses on only the one island as it is assumed no undersea cables are envisaged in the proposal.	The grid has been and is the subject of assistance from AfDB and WB. Electricity from geothermal energy will only supply Grande Comore. It will be very expensive to have the other islands connected by undersea cables, as just some 600 metres from the coastline, the ocean floor separating the islands makes a sudden sharp drop to 2,000 metres.	Pages 20 and 5.
8. By way of comparison, solar PV generation costs would likely be within a similar cost range per kWh under this level of solar radiation based on current costs but further analysis would be required to confirm this. Solar PV technologies can be more widely distributed across all three islands of the union of Comoros and either employed as mini-grids or individual solar homes to avoid high investments in distribution infrastructure. In other words, a $81.3M investment in solar PV would enable electricity to be generated and distributed on all three main islands of the Comoros and might therefore benefit a greater proportion of the total population currently without electricity access than would geothermal energy. The above is a hypothetical scenario assuming that financing comparable to the geothermal proposal could be mobilized ($81.3M). It is provided to illustrate the comparable, if not higher cost-effectiveness of PV energy generation versus geothermal generation.	The LCOE analysis has shown the cost of electricity generation from the various sources to be as follows: For PV to generate the same amount of energy generated by a diesel power station on a 24-hr basis, some 48 MWp of PV will need to be installed, together with battery banks amounting to 6.49GWh.. To achieve this, some 25 -30% of Grande Comore will need to be covered with solar panels, turning the slopes of Mount Karthala into a big "solar panel desert" – there is full sunshine only equivalent to 5 hrs/day, maximum, when cloud cover, rain and darkness are factored in.	Annex H of the ProDoc
9. Furthermore, while there is a number of specific risks faced by PV projects such as, for example, construction risks, risks	To provide the base-load that is now provided by diesel generation, geothermal is presently the best option. This situation may change when OTEC or	Page 26.



affecting the viability of project development, financial risks of insufficient access to investment and operating capital, technology risks and risks of variable changes in electricity generation due to lack of sunshine, many of these risks are easily addressed and accounted for. PV energy generation technologies are proven and considerable experience, including in the region, is available.	Wave Technology become commercially viable in the future or an inexpensive technology is developed to use solar energy to produce hydrogen that, in turn, can be used to generate electricity.	
10. Unlike PV, in addition to technology and operational risks, geothermal energy generation faces a range of substantial environmental risks that would be difficult to control in the condition of SIDS. Geothermal power plants can have impacts on both water quality and consumption. In many instances, not all water removed from the reservoir for cooling is re-injected because some is lost as steam. Water is also consumed during the drilling operations. Produced toxic sludge should be properly disposed of, and STAP is concerned with limited capacity for hazardous waste management. Land-use issues may arise depending on the properties of the resource reservoir, the amount of power capacity, the type of energy conversion system, the type of cooling system, the arrangement of wells and piping systems, and the substation and auxiliary building needs. If geothermal sites are located in remote and sensitive ecological areas this should also be considered in project planning. Because of water abstraction, there is an increased risk of land subsidence. Furthermore, as mentioned in the proposal, the location of sites is in geologically active "hot spots" with elevated earthquake risks. There is evidence that hydrothermal plants can lead to an even greater earthquake frequency [National Renewable Energy Laboratory (NREL). 2012. Renewable Electricity Futures Study]. Transparent communication with local communities may be necessary if sites are located close to settlements.	Geothermal energy is being planned for development in several SIDS countries, including Dominica, Fiji, Guadeloupe, Montserrat, St. Kitts & Nevis, St. Lucia, Réunion and Vanuatu. Phase 2 activities, as proposed in the Prodoc, will include an Environmental and Social Impact Assessment (ESIA) and infrastructure issues such as road access to the project site, water for drilling operations as well as sludge storage. The report quoted by STAP "NREL: Renewable Electricity Futures Study, Vol. 2, Chapter 7, August 2012"indicates that "Relative to fossil energy, new geothermal plants have benign impacts in the areas of solid and gaseous emissions, water use, water pollution, and land use; however, the development of geothermal reservoirs has its own distinct environmental challenges. Land subsidence and induced seismicity, which depend on local geology, affect the areas around geothermal reservoirs to varying degrees, and they must be appropriately addressed to avoid serious consequences". On land subsidence, it indicates that it "is not a problem in most hydrothermal environments, can be managed by reinjection of produced fluids in the rare instances of fluid production from unconsolidated sedimentary formations". With regard to induced seismicity, it indicates that "its direct effect on the surrounding environment is normally negligible and can be successfully managed through proactive risk communication, proper siting, technology research and development, best practice methodology implementation, monitoring, and mitigation strategies". All issues identified in the ESIA report will be properly addressed. In addition, regular communication with the communities located some 10 km down the slopes of Mount Karthala will be	Page 29. Page 32.

	maintained at all times.	
11. Balancing the uncertainty of the geothermal resource and the time needed for exploration and plant construction against the urgent need to provide secure electricity supply that solar PV could provide could involve greater analysis. It appears it may be too late for geothermal to substitute for the heavy fuel oil-fired plant already under construction. However, an argument could be made that solar PV could provide an economically viable alternative with lower greenhouse gas emissions, be developed in the short term, have much lower business and environmental and social risks and hence avoid future GHG emissions from the oil-fired plant over its lifetime of several decades. Meanwhile, the proposed geothermal assessment and exploration could be undertaken in parallel, or as a future project as more funding becomes available, so that together solar PV and geothermal can then meet the increased electricity demand with low carbon emissions per MWh.	The 18 MW heavy fuel power station is expected to come on line in early 2018 to take care of the immediate needs of MAMWE to supply the population. When the 10 MW geothermal power station comes on line in 2024, all other diesel generators would be retired, as they would have already reached their useful life. However, the heavy fuel plant will still be used to top up the short-fall not met by the geothermal plant until 2028 when it can also be retired or, if still in good running condition, be maintained as reserve capacity. Solar energy will still form part of the energy mix on Grande Comore. As indicated in the Prodoc, the utilisation of geothermal resources on Grande Comore for base-load grid-electricity generation does not exclude utilisation of the abundance of solar energy to supplement electricity generation utilising PV whenever the sun is shining and for solar heating.	Pages 9 and 30. Page 25.
12. Therefore, STAP's recommendation is for a life cycle cost/benefit analysis to be undertaken to ensure that geothermal energy generation does indeed provide the best economic, environmental and social value for the investment since the GEF investment of a similar amount in solar PV systems could be a more attractive proposition that could be delivered in the shorter term. Perhaps this has already been done in the EU Energy Strategy Action Plan, but if so, it was not mentioned in the proposal.	The PPG followed STAP's recommendation and undertook an LCOE analysis that shows geothermal electricity generation to be the least cost option. The findings of this analysis are provided in the Prodoc.	

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

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

<table>
<tr><th rowspan="2">Project Preparation Activities</th><th colspan="3">GEF Amount ($)</th></tr>
<tr><th>Amount Approved</th><th>Amount Spent to date</th><th>Amount Committed</th></tr>
<tr><td>Inception workshop</td><td rowspan="5">140,000</td><td rowspan="5">68,123.00</td><td rowspan="5">71,877.00</td></tr>
<tr><td>Technical review and baseline analysis</td></tr>
<tr><td>Define institutional arrangements and monitoring and evaluation framework</td></tr>
<tr><td>Financial planning and co-financing investments</td></tr>
<tr><td>Validation workshop</td></tr>
<tr><td>Total</td><td>140,000</td><td>68,123.00</td><td>71,877.00</td></tr>
</table>