



UNITED NATIONS DEVELOPMENT PROGRAMME

REPUBLIC OF MALDIVES

Maldives: Renewable Energy Technology Development and Application Project (RETDAP) MDV/O3/G35/A/1G/99 (GEF) PIMS 2131

Summary:

The development goal of the proposed project is the reduction of the growth rate of GHG emissions from fossil fuel using activities, particularly diesel power generation through the removal of the major barriers to the development and application of renewable energy-based systems that can supplant part of the fossil fuel use in the Maldives. The project will quantify and evaluate the potentials of available renewable energy (RE) resources in the country for electricity and non-electricity applications.

The Renewable Energy Technology Development and Application Project (RETDAP) will facilitate the promotion of the widespread implementation and ultimately, commercialization of RE technologies (RETs). The project seeks to establish an environment conducive to the adoption and commercialization of RETs in the country. It involves the design, development and implementation of appropriate policies, strategies and interventions addressing the fiscal, financial, regulatory, market, technical and information barriers to RE development and utilization. It will also involve the development of interventions for strengthening of the relevant institutional structures and national capacity for the coordination and the sustainable management of RE initiatives in the country. RETDAP also involves capacity building activities for enhancing the country's capability in establishing workable and viable schemes for supporting RET applications with emphasis on the design, development, financing, implementation and management of such RE projects, taking into consideration relevant lessons from past RE projects in other Small Island Developing States (SIDS).

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I. SITUATION ANALYSIS

I.1 Project rationale

The Republic of Maldives is an archipelago consisting of about 1,190 islands, dotting the Indian Ocean, of which 199 islands are inhabited. It is located between latitudes 7° 06' 35" N to 0° 42' 24"S, and longitudes 72° 33' 19" E to 73° 46' 13"E. Male', which is the capital and main city of the Maldives is home to about a quarter of the country's population. In 2000, the population of Maldives was 289,177 of which 73,833 in Male'. The total land area of the country is 300 km². The land areas of the islands vary considerably, some of them having approximately 5 km² whilst are as small as 0.2 km². The total area including the sea within the territorial waters is 859,000 km².

Most of the islands are in an atoll chain and are flat and low-lying; an estimated 80% of the land area lies less than a meter above the sea level. The Maldives is in the tropical climate belt with a mean annual temperature of 28°C with a daytime peak of 31°C and a night time low of 25°C. There is a little seasonal variation in temperature. The average annual rainfall for the year 1990 – 1999 is 2134 mm and there is an average of 8 hours of sunshine per day. The wettest months of the year are May, August, September and December and the driest being January to April. The weather is mainly dependent on the monsoon. There are two monsoon periods: Southwest monsoon (April to November) and Northeast monsoon (December to March).

The Government of Maldives (GoM) is very much aware and concerned about environmental degradation and global warming and their detrimental effects particularly on the small island nations like the Maldives. Sea level rise, which is among the real threats of climate change, is among the country's immediate concerns. The very existence of the country is threatened, as over 80% of the land area of its islands are less than a meter above mean sea level.

Maldives has no conventional energy resources (e.g., oil and gas) that it can utilize to meet its energy needs. Basically, the country utilizes imported petroleum fuels to meet all of its energy needs. Bulk of these fuel imports is diesel fuel oil (DFO), which is mainly used for power generation both by the state power utility (STELCO) and close to 1,000 other electricity generators in the outer islands. DFO is also used in seawater desalination (for potable water production) and in steam generation. Petroleum products are also used in land transport (e.g., gasoline, high-speed diesel), including aviation (jet fuel), industries, and households (e.g., kerosene, LPG). Firewood (e.g., dried branches) is also a main cooking fuel in most of the outer islands.

Although the country is expected to continue to rely on imported fuels for most of its energy needs, renewable energy (RE) resources such as solar, wind, biomass and biogas are recognized as potential energy alternatives. RE resources, whether used in stand-alone or in hybrid systems can displace part of the present imported conventional energy forms (mainly DFO) that are used in the country. Not only will this translate to reduction of greenhouse gas (GHG) emissions (i.e., equivalent to the amount emitted from the burning of the displaced DFO) but also the fuel cost savings. In line with its objective of mitigating climate change caused by the emission of GHGs from fuel use, the utilization of available RE resources can be developed and utilized to contribute in meeting the long term energy (thermal and electrical) requirements of the country. RE forms have the clear advantage of minimal negative environmental impacts and being resources that are continually renewed. However, this can only be realized if existing barriers to RE development and application that hinder the development and implementation of RE technologies in the Maldivian context will be removed.

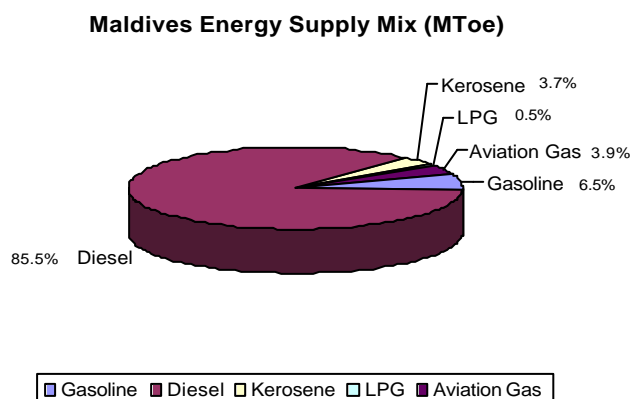
Energy in the Maldives

The most common forms of energy used in the Maldives are petroleum fuels, which are for power generation, transportation, lighting and food preparation. These include diesel fuel oil (DFO), gasoline, aviation fuel, kerosene and LPG. DFO (similar to automotive diesel) is used mainly for power generation. Together with gasoline, DFO is also used as fuel for automobiles and marine outboard engines in the transportation sector. It is also consumed by ocean-going ships calling at Male'. DFO is also used in industries (e.g., sea water desalination in Male' and the cement and LPG bottling industry in Thilafushi island near Male'). Most urban households use LPG and kerosene for cooking. In the outer islands, the main source of energy for domestic purposes has been biomass. Nowadays, more outer island households are now using kerosene and LPG for cooking instead of biomass materials (shrubs and coconut husks). The energy supply mix in the country (excluding biomass, which is not quantified) is as follows:

Energy Carrier	Typical Uses	Energy Supply, Mtoe
Kerosene	Lighting and cooking	5,070
LPG	Cooking, Industrial metal works	630
Diesel	Land and water (domestic and international) transport, industrial operations, and electricity generation	117,998
Gasoline	Land and water transport	8,979
Aviation Fuel	Air transport (domestic & international)	5,353

Diesel fuel oil accounts for bulk of the energy supply in the country (about 85.5%). Gasoline accounts for 6.5%; aviation fuel, 3.9%;, kerosene, 3.7%; and LPG, 0.5%.

The majority of Maldivians live in locations with full day availability of electricity. The State Electric Company (STELCO) provides 24-hour electric power to 24 of the 199 inhabited islands including Male'. Generators operated by Island Development Committees (IDCs), with the financial assistance of the Ministry of Atolls Administration (MAA), serve an additional 50 islands and private providers serve 6 islands with 24 hours of electricity a day. The remaining 115 islands have at least 5 to 12 hours electricity service. The Asian Development Bank (ADB) supports an Outer Islands Electrification (OIE) project, which focuses on electrification with 24-hours service community generators (facilitated by an US\$ 8 million loan to the Government of Maldives) on 40 islands. Electricity is generated through direct combustion of diesel fuel oil (DFO or Fuel No. 2). STELCO, a wholly state owned company, is regarded as the national power utility. The Maldives Electricity Bureau (MEB), chaired by the Ministry of Trade and Industries, regulates STELCO and the private and community power providers.



Data on electricity generation and consumption in the Maldives are limited to that of STELCO power plants, which collectively account for about a little more than a third (34.9%) of the total installed power generation capacity of the country. The total installed power generation capacity in the country is 106.2 MW, bulk of which, are in the resort islands (48.3%). Those in the outer islands operated by the IDCs and some private generators account for 13.2% of the total power generation capacity. The rest are those installed in airports (3.5%). About 33% of the overall

electricity generation in the country is through STELCO. Power generation data from the resort islands (private entities) are not available. However, their power generation can be estimated from the

diesel fuel oil that they consume (less transport consumption). The only available information about electricity production in the Maldives are those from power plants of STELCO. Those from the IDCs and private power generators that are serving the outer islands are just estimated based on information regarding diesel fuel consumption in the outer islands.

Renewable energy resources in the Maldives

The 3 potential RE resources in the Maldives are: (1) Solar; (2) Wind; and (3) Biomass. Currently, RET applications are limited to some applications of solar photovoltaic cells in navigation lights and outer island telecommunication systems.

Solar and Wind Energy

At present, wind and solar data for resource assessment are only partly available. On solar energy, the only available data from the country's Department of Meteorology (DMet) are the number of hours of sunshine per day. There are no data available on solar energy radiation. DMet also measures wind speeds at various airports in the country. These wind measurements are at 10 meters above the ground, and because of the low altitude, these are not representative of wind speeds at the higher levels at which turbines are usually positioned. These measurements were taken at 3-hour intervals, and they show average wind speeds varying between 7.2 knots – 11.3 knots. Recent measurements made by the US-based National Renewable Energy Laboratories (NREL) have indicated that the largest wind potential in the country is in the islands located between 4.5° and 6° N latitudes.

Biomass Resource

The main source of energy for domestic purposes in most of the outer islands has been biomass. Fuel wood is used for cooking and smoking of fish. Biomass includes dry branches from trees and shrubs, coconut husks, dry coconut leaves, coconut shells. However, with the depletion of wood resources and subsequent restrictions on tree cutting, households have switched to kerosene and LPG for cooking instead of biomass materials.

Another source of biomass material is municipal solid waste. According to the Municipality Waste Management Section in Male', the typical composition of municipal solid waste is: paper and cardboard (33%); kitchen waste (15%), and construction waste (industrial/scrap) (52%). About 15% of the construction waste is wood. Daily solid waste generation in Male's is on the average 140 tons. Biodegradable waste (mainly food waste) is about 25 tons/day.

The solid waste is sorted prior to transporting to the island of Thilafushi. Only the biodegradable and combustible materials (i.e., organic) are dumped in the pits. The combustible materials are burned first before the ashes (plus unburned matter) are dumped into the pit. The landfill area is already 10 years old. Previously it was just a reef and now it has now a reclaimed area of 100,000 m². Some industries now exist in the area such as a cement packing plant and a LPG refilling plant. Landfill gas from the area can be recovered and utilized for power and heat generation for use by the industries located in the area.

I.2 Current situation

The electrification needs of the country are presently met through diesel power generation either by STELCO, the IDCs or private power generators. It is forecast that this will remain to be the situation in the next decade unless other alternative means of power generation, possibly RE-based, will be employed. There is currently an ongoing outer island electrification project, financed through a US\$ 8

million loan from the Asian Development Bank (ADB). This project aims to improve and enhance the diesel power generation in 40 outer islands.

Regarding RE utilization in the country, as mentioned earlier, there are already some RET applications in the Maldives but these are limited mainly solar photovoltaic systems in navigation lights and outer island telecommunication systems, as well as modest use of solar water heaters in Male' and in resort islands. Although the country is expected to continue to rely on imported fuels to meet its energy needs, some RE resources are recognized as potential alternatives, being indigenously available, having minimal environmental impacts and contributing to the balanced provision of services to dispersed island communities. The potential RE applications are the following:

- Solar photovoltaic and wind power systems used in hybrid systems with diesel generators in the (outer) islands;
- Landfill gas recovery and utilization in the island of Thilafushi where the biologically degradable waste from Male' are disposed;
- Possible use of household or village bio-digesters to produce biogas out of kitchen waste and other agricultural waste; and,
- Passive solar technology in water heating, fish and crop drying, seawater desalination and other applications.

The GoM is committed to promoting sustainable energy in the country and has mandated its Ministry of Communications, Science and Technology (MCST) to formulate policies and plans on energy for the benefit of its citizens. MCST has also been designated as focal point for RE development in the country and is now actively pursuing several inter-related initiatives to overcome the existing barriers to the widespread development and application of RETs.

There were very few activities that were carried out in the country in the past in the field of RE development and applications. Most of these were projects supported by the UNDP in the 80s on sustainable energy development. These are mainly pilot projects, which test the technical viability of solar and wind energy utilization. Some limited solar and wind energy resource assessments were also carried out. The wind data collection activities that are still being carried out in the country's airports are among the activities that were initiated in those earlier projects.

Recent initiatives on RE development

Recent initiatives in the area of RE development in the country include RE resource assessments, energy policy formulation, capacity development, awareness and institutional strengthening. Some of these initiatives will be carried out as integral parts of the RETDAP.

South Asia Regional Initiative (SARI) -USAID

Maldives is part of the USAID-supported regional project on RE resource assessment, referred to South Asia Regional Initiative (SARI), which complements the global SWERA (Solar and Wind Energy Resource Assessment) initiative, implemented by the United Nations Environment Programme (UNEP) with GEF support. The US-based National Renewable Energy Laboratories (NREL) will carry out SARI by doing an integrated wind and solar resource assessment using satellite and global data as a primary source. This study will use the latest available techniques to develop accurate and valid estimates of the amount and distribution of wind and solar resources. Geographic information systems (GIS) will then be applied to integrate the data with available local data and other critical infrastructure information to assist in the planning and development of these energy resources. The results of the NREL study can also be used (if available on time) as guide for the GoM in the final selection of the wind measurement sites under the resource assessment component of the RETDAP.

Assistance to Maldives in Developing the Energy Sector through Energy Resource Assessment Leading to Sustainable Energy Policy Formulation – UNDP and UNOPS

Funded by the UNDP Thematic Trust Fund on Energy for Sustainable Development (Energy TTF), this project will address the lack of capacity within the country to assess, plan, implement and monitor RE technologies. It involves capacity building to ensure the sustainability of any RE program introduced in the country and the availability of basic data on RE resources. Included in this project are the activities financed through the UNOPS-executed Nordic Funds.

Technical Assistance on the Development of the Energy Agency - ESCAP

As part of institutional strengthening in the energy sector, MCST will make use of the technical assistance (TA) provided by the UN Economic and Social Commission for Asia and the Pacific (ESCAP) in setting up an Energy Agency. This TA will focus on recommendations on the structure of the energy agency, policy development, and training needs for staff members as well as budget requirements for the agency.

Demonstrations and Pilot Projects

A joint initiative between the government of Maldives and UNDP is seeking potential partners to fund the purchase and installation of the solar /wind component of a solar/wind hybrid pilot system. The pilot projects will provide sustainable access to electricity to remote islands and will provide the basis to promote the long-term use of renewable sources of energy and electricity generation. The Nordic Funds are being eyed as a potential source of finance for the planned pilot projects, including the Government of Canada, which has also expressed its interest.

All the above initiatives together will form a comprehensive agenda through which sustainable energy practices will be established in the Maldives. Since the MCST is the national coordinating agency in all these projects on behalf of the GoM, this will ensure that each project complements the other and does not duplicate outputs or activities.

RE resource utilization for power generation was identified as one of the feasible options for the country in addressing climate change. Apart from the RETDAP, there are ongoing and planned initiatives in the area of climate change in the country. These are:

- Climate Change Enabling Activities Project: This is being executed by the Environment Section (ES) of the Ministry of Home Affairs Housing and Environment (MHAHE) and UNDP-Male'. It assists the Maldives in meeting its obligations to the UNFCCC. Maldives has already submitted its First
- National Communication to UNFCCC. The CCEAP started in 1995 and at present, preparations for the Technology Needs Assessment (TNA) activities are ongoing. The TNA will identify and evaluate technology needs in climate change and build capacity to assess technology needs, modalities to acquire and absorb them, design, evaluate and host projects.
- National Adaptation Program of Action (NAPA) - Maldives has recently decided to do a NAPA and a draft project document has been developed and is presently being finalized. The project will develop a specific priority program of action for adaptation to climate change.
- National Capacity Self-Assessment (NCSA) - Maldives has applied for GEF funding for developing its NCSA to assess capacity needs and priorities with respect to the global environment and its context within sustainable development. The NCSA proposal development is currently underway using PDF-A funds from GEF.

Existing situation on micro-finance

There are a number of mechanisms in the country, through which credit is made available for development activities such as generation of electricity, fishing, infrastructure development and various income generating activities. The Bank of Maldives through its Development Banking Cell is the front runner. Various government ministries and offices operate micro credit programs for specific purposes. These are financed through the Ministry of Finance and Treasury from the government budget or through donor assistance. These funds are used for a number of purposes that include electrification in

the islands, fishing boats, fish processing and on lending to women. Management of the funds is done by the individual Ministry or organization in charge of a particular credit program.

The micro finance component of the RETDAP is based mainly on the Ministry of Atolls Developments' Atoll Development Funds (ADFs) under the UNDP supported Atolls Development Project. The funds are set up with seed money from Government of Maldives, UNDP and Atoll Communities. The ADFs provide credit for both community and individual based income generating activities. The money allocated to and held by ADFs belongs to the community of that particular Atoll. The ADFs to date have been established with direct approval from the Presidents office with Ministry of Atolls Development held accountable for the funds. The ADFs are managed by the ADP office when the ADP is ongoing. However, once the project is over the operation of the ADFs are handed over to the Atoll Development Committees.

UNDP has been working with the Maldives Monetary Authority to formulate an improved framework and operating environment for micro credit funds and improving the monitoring and performance evaluation of Government credit programs. In this regard UNDP has initiated a study on "Strengthening the legal Framework for Monitoring of Microcredit in the Maldives". As a continuation of the initiative UNDP has entered into agreement with UNCDF to get periodical technical expertise for strengthening the overall microfinance framework of the country. The purpose of UNCDF input being to support ADFs with long-term, consistent and high quality micro finance expertise.

Based on the evaluation of the current ADFs, UNDP's new Atoll Development Project will establish ADFs in two more Atolls and provide technical support to strengthen the management of ADFs. Key activities under the new ADP will focus on giving a legal form to the ADFs; making operation procedures more transparent; building capacity to manage ADFs and introducing monitoring and control system to align with Maldives Monetary Authority.

Baseline scenario and barriers to the development and application of RE systems

Considering the power generation from STELCO, the resort islands and fishing industry, the forecast annual growth rate of electricity generation during the period 2000-2010 is 7.5%. This growth rate is similar in magnitude as the country's GDP growth rate. That from the IDCs would be higher once the outer island electrification projects are completed, with estimates placed at 30% to 40%. With the prospects of higher electricity generation and consumption, a commensurate increase in DFO consumption is also expected, as well as the associated CO₂ emissions. The maximum demand in the STELCO system is forecast to increase by 7.6% per year. In 2000, the annual per capita electricity consumption in Male' was 989 kWh. In the outer islands that are already electrified, the average annual per capita electricity use varies between 180 and 250 kWh.

Figure 1 shows the forecast electricity generation and fuel consumption in Maldives. The forecast includes power generation in STELCO power plants, as well as in the resort islands and industrial enterprises (primarily fishing) considering a "business-as-usual" scenario. Figure 2 shows the GHG emissions (mainly CO₂) from the projected diesel fuel consumption for power generation. CO₂ emissions from diesel-based power generation in 2002 amounted to 221,707 tons.

The ongoing ADB-financed Outer Islands Electrification Project (OIEP) is for the promotion of electrification of about 40 outer islands in the Republic of Maldives by financing (i) procurement of diesel generating units; (ii) augmentation and expansion of distribution systems; (iii) implementation consulting services for project designs, preparation of tender documents, assistance in bid evaluation, construction supervision, and training; and, (iv) management consulting services for capacity building of the sector regulator and institutional designs for electricity supply utilities. As per instructions of the GoM (through MCST), the RETDAP will initially focus on the STELCO islands and the outer islands that will not be covered in the ADB-financed OIEP.

Fig. 1: Forecast Electricity Generation and Fuel Consumption (2003-2010)

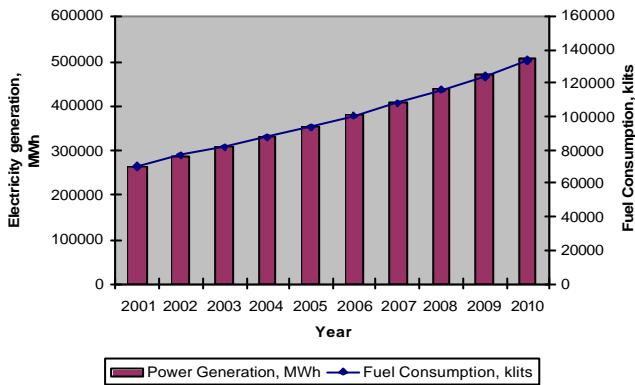
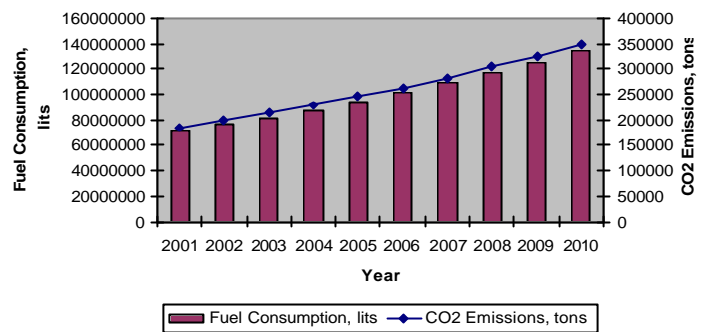


Fig. 2: Forecast CO2 Emissions from Power Generation (2003-2010)



As previously stated, the GoM is committed to promoting the development and use of available RE resources in the country. MCST is now actively pursuing several inter-related initiatives to overcome the existing barriers to the widespread development and application of RETs. Despite the present attempt of the country to develop its RE resources, there are various barriers that hinders the GoM in pursuing widespread utilization of RE for sustainable development of the country.

The PDF-A exercise that was carried out to develop the RETDAP had identified various barriers that are hindering the development and application of RE in the country. While the GoM recognizes that RE could contribute to meeting the sustainable development needs of the country, these barriers have to be eliminated in order to realize the anticipated economic and environmental benefits of RE. The following are the identified specific barriers to the widespread utilization and application of RE technologies in the Maldives:

- Inadequate information on the availability of RE resource – Presently, apart from some data on wind speed and daily sunshine hours from climatological observations, there are no information on the magnitude of RE resource potentials in the country, which could be utilized in designing and developing RE-based projects either for electricity and non-electricity purposes. People in the country, particularly in the outer islands are not aware of the various aspects of the installation and operation of RE systems, let alone awareness about what RE is and its benefits.
- Inadequate information on the options available for RE technology – There are no available information that can be easily accessed by interested users and investors on RE technology options, due to inadequate studies made in the past, and the absence of information on available RE resources in the country.
- Lack of policies on the utilization of RE – Although the GoM has committed itself to pursue the development of RE resources as a means to sustainable development, there are no clear policies in place that would support efforts to engage in RE-based projects in the country. There is a need for policies and regulations regarding financial and economic incentives to undertake RET applications in the country.
- Inadequate capability of the key players in the government sector in the development, design, implementation and management of RE technology application activities – Because of the complete dependence on fossil fuels, capacity among the government policy makers and technical people in RE development is very limited. Presently, there is very limited trained manpower in the country to assess, plan, implement and monitor RE technology development and implementation on a significant scale
- Limited institutional mechanism to support widespread dissemination of RE technologies, as well as in the diffusion of knowledge and skills in the operation and maintenance of RE systems – Before 18 July 2002, Maldives has no national energy office (NEO) that looks after energy issues in the country, from energy supply and consumption, let alone RE development and utilization.

The NEO is practically still in diapers and would need significant capacity building and technical assistance for it to carry out its mandate, among which, is the promotion of widespread development and utilization of RE in the Maldives.

- Limited involvement of entrepreneurs in producing and servicing RE systems – Except for a few entrepreneurs that are interested in engaging in RE business, there are no other businessmen in the country that have expressed interest in venturing in the RE business. This is attributed to lack of awareness and knowledge about RETs and the RE business among them, along with cynicism from some who thinks that RE is not a technically and economically feasible source for power generation in the Maldives. There is a general perception that the private sector is not interested in investing in RE business.
- Lack of significant field demonstration of RE technology applications – To the few individuals who have some knowledge and/or have some orientation about RE technologies are still doubtful whether such technologies will work in Maldives. There is a need for successful demonstration of actual applications of the appropriate RETs in order to convince potential users.
- Financial viability of RE project ventures (stand-alone or hybrid systems) are not yet established on a significant scale – Because of the absence of reliable resource assessment information), it is very hard for prospective entrepreneurs to engage in RE-related businesses.
- Lack of financing available for RE applications as well as for RE-based livelihoods projects – The available financial assistance to the outer island communities are those from existing credit schemes of government agencies such as the Ministry of Fisheries, Agriculture and Marine Resources; Bank of Maldives, and MHAHE. The available assistance for energy projects is for the purchase of portable diesel power generator sets.

The RETDAP is designed to address the above barriers, seeking to remove them in order to facilitate the widespread utilization of RE resources in the country. This is in line with the GoM's aim of utilizing RE resources for national sustainable development. Overall, the RETDAP would contribute to, at least in the reduction of the growth rate of GHG emissions from the diesel-based power generation in Maldives. The success of the full project is envisioned to encourage the widespread application of RE technology not only to meet the electricity needs of the country but also provide the other energy requirements in the other major sectors of the national economy.

II. STRATEGY

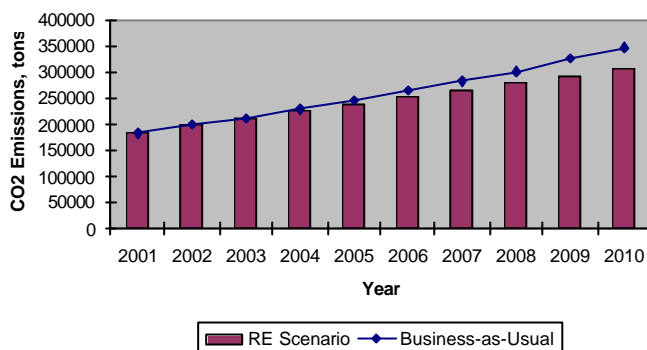
II.1 Alternative scenario

The proposed GEF-supported alternative to the "business-as-usual" scenario in the area of RE development and application in the Maldives is intended to contribute in realizing the country's sustainable development objectives and its goal of reducing the annual growth rate of GHG emissions through the promotion and facilitation of the widespread use of RE. The RETDAP will comprise a range of interventions that will address major specific policy, institutional, information, financing, and technical barriers that currently exist.

The proposed alternative will bring about a modest increase in the utilization of RE displacing fossil-based fuels, particularly for power generation, at least up to the year 2010. Beyond that, when the barriers to RE development and applications would have been removed, the share of RE in the country's energy mix will become more significant. Under the alternative scenario (i.e., RE scenario), part of the electricity generation using diesel generators will be supplanted by RE-based energy systems. Figure 3 shows the comparison of the electricity generation from STELCO in the "business-as-usual" and alternative scenarios.

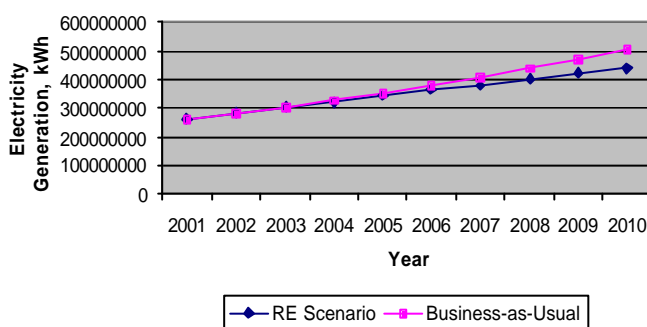
The annual diesel-based power generation growth rate is expected to be about 5.9% in the RE scenario. By end of the RETDAP implementation, about 2.1% reduction in the annual growth rate in power

Fig. 4: Forecast CO2 Emissions from Power Generation (2003-2010)



generation (business-as-usual) is anticipated. With the reduction of diesel-based power generation, DFO consumption will also decrease, as well as the associated CO2 emissions. Under the business-as-usual scenario, the annual growth rate of CO2 emissions from diesel-based power generation is 7.4% (2001-2010). In 2002, the total CO2 emission from power generation was about 199,617 tons CO2. In the RE scenario, the annual growth rate of CO2 emissions is estimated at 5.8%. Figure 4 shows the comparison of the CO2 emissions trend in the business-as-usual and RE scenario.

Fig. 3: Forecast Electricity Generation (2003-2010)



At the end of the project, when the identified barriers would have been removed (particularly the technical and economic feasibility of RE-based energy systems), a wider utilization of RE resources is expected in the country. The resulting reduction in demand in fossil fuel consumption (especially diesel generated electricity) would bring about a reduction in GHG emissions by at least an average of 2.2% per year.

II.2 Outputs and activities

It is assumed that in the absence of the proposed GEF-supported OP-6 project, Maldives will continue to utilize fossil-based fuels for its energy needs (electricity and non-electricity). Whatever efforts to promote and utilize RE there might be these would be based on unreliable and unsubstantiated data on RE resource potentials. The result will be a continued under-development of the country's RE potential and thus significant GHG emissions from fossil fuel use for both electricity and non-electricity purposes

The RETDAP will be implemented for 4 years. It will involve activities that will promote the adoption of RETs as part of Maldives' sustainable development efforts as well as the country's endeavour to reduce GHG emissions and mitigate the harsh impacts of climate change. The RETDAP is comprised of activities that will sustainably remove the identified barriers to RE development in the Maldives, and somehow level the playing field for RE development in the light of the substantial contribution of fossil fuels in the country's energy mix. The expected outcomes of the project activities are detailed in this section.

Output/component 1: RE Advocacy and awareness

A RE Information Centre at the MCST is established, with a fully functioning information exchange program, and a “one-stop-shop” service for RE project assistance. Adequate capacity building on RETs is provided to the NEO, and Outer Island and Atolls (OIA) inhabitants. Publication and circulation of a quarterly newsletter, production and dissemination of information materials on RE technology, as well as multi-media campaign materials on RET applications become regular functions of the NEO, including the annual monitoring of, and dissemination of information about, RE-based energy projects or installations in the country.

The areas of activity are:

- 1.1. Establishment of a RE Information Centre in MCST – A RE Information Centre will be established within the NEO (in MCST) to cater for the information needs of the citizenry (government, Male’ and outer islands population) regarding RE, in general, and solar/wind/biomass energy, in particular. *GEF support is required to supplement funds for the establishment of information centre.*
- 1.2. Design and conduct of a RE Technology Education Program - This activity will consist of in-house training course on RETs for NEO staff and local engineering firms, and comprehensive training courses on the maintenance and operation of RE-based energy systems for people in the outer islands. These training courses are expected to continue even after the completion of the project. *GEF support is needed for capacity building activities (also supported by Energy TTF).*
- 1.3. Establishment and implementation of an Integrated RE Information Exchange Service – This activity will be implemented to obtain and share information on RETs within and from outside the country. The information exchange service, which will continue even after the completion of this project, will involve publication of a newsletter containing information circulated through the information exchange service (local/ regional), monitoring of all RET application projects in the country and preparation and updating of profiles of these facilities, and abstracting of relevant articles from scientific and engineering journals on RET. *GEF support is needed for associated technical assistance activities.*
- 1.4. Conduct of Information Campaigns on RE Technology Applications in Outer Islands and Atolls (OIAAs) – This activity will involve the publication and dissemination of printed information materials on RETs, and the production and airing of multi-media campaign materials on RE technology applications. A RE product exhibition fair will also be organized and conducted to showcase RET equipment and components. *GEF support is needed for associated technical assistance activities (also supported by Energy TTF).*
- 1.5. Introduction of a “one-stop-shop service” for RE market services – This activity will involve the design and implementation of a “one-stop-shop” service for prospective RE project developers and implementers. The service will become part of the regular work of the NEO and could evolve into something that will also cover services for all other energy activities in the Maldives. *GEF support is not necessary.*

Output/component 2: RE Resource Assessment

RE resource (wind, solar, biomass, landfill gas, etc.) surveys in selected areas in the country are completed, and information gathered are compiled and analyzed. Suitable methodologies for RE resource assessment, monitoring and simulation of wind and solar energy resources are prepared, and relevant government agencies become knowledgeable on RE resource data gathering, interpretations and analysis, and on RE monitoring and simulation. A comprehensive RE resource

database covering selected island/atoll groups is developed and installed and maintained at the NEO/MCST.

The areas of activity are:

- 2.1. Conduct of RE resource survey - This activity will involve the conduct of surveys of the potential RE resources in various sites of the country. The surveys will be carried out under the UNDP (TTF)-, and UNOPS (Nordic Fund)-supported project on *Assistance to Maldives in Developing the Energy Sector through Energy Resource Assessment Leading to Sustainable Energy Policy Formulation*. Detailed assessments will be carried out to determine the technical requirements of the potential RET applications, including biomass utilization, biogas generation and use, and landfill gas recovery and use *GEF support is not necessary (supported by TTF and UNOPS/Nordic Fund)*
- 2.2. Development of a RE Resource Assessment Methodology - A RE resource assessment methodology, tailor-made for the Maldives, will be developed and used in conjunction with the RE resource assessments and RE resource database development. Training on the application of the methodology is included under this activity. *GEF support is not necessary (supported by TTF and UNOPS/Nordic Fund)*
- 2.3. Design and development of a RE resource database - A database for RE resources in the country will be designed and developed under this activity. The database will include various modules for the data storage, data analysis/assessment, and RET information. This activity will also include training on the operation and maintenance of the database. *GEF support is not necessary (supported by TTF and UNOPS/Nordic Fund)*
- 2.4. Development of a RE monitoring and simulation methodology - A computerized simulation program will be developed to be used in evaluating and predicting trends/patterns and characteristics of the RE resources availability and potentials in other areas in the country. *GEF support is required for TA in the development of the computerized simulation programs*
- 2.5. Conduct of capacity building program on RE resource assessment for relevant government agencies – This will involve the conduct of training courses on RE resource assessments for the technical personnel of relevant government agencies particularly NEO, MCST, MHAHE, and DMet. *GEF support is not necessary (supported by Energy TTF)*.

Output/component 3: RE Policy Development and Institutional Strengthening

An adequately staffed National Energy Office (NEO) is established, along with the enforcement of a clear government policy on the promotion, development and utilization of RE both for electricity and non-electricity applications. Policy and regulations on the production and sales of RE electricity, as well as implementing guidelines covering pricing and incentives are developed and implemented. The energy balance of Maldives, and the country's Initial National Energy Plan are prepared. NEO personnel as well as planners from relevant government agencies are adequately trained and are performing least-cost integrated energy planning by end of project.

The areas of activity are:

- 3.1. Strengthening of the newly established National Energy Office (NEO) – This activity will entail the selection and staffing of the NEO, and will be carried out in conjunction with the project on *Technical Assistance on the Development of the Energy Agency* by ESCAP. *GEF support is required for capacity building activities (also supported by ESCAP)*.

- 3.2. Formulation and implementation of a national energy policy incorporating RE development, utilization and pricing – Technical advice will be provided in the review of existing RE-related policies and regulations in Maldives (as well as those from other countries) and RE resource development and utilization. The conduct of an electricity tariff pricing study for electricity generated using RE is also part of this activity. Possible policy support activities and strategies that can be considered to encourage private sector involvement and financing in RE-based energy projects will be evaluated. *GEF support is not necessary*
- 3.3. Conduct of RE promotion workshops focusing on the relevant policies, policy instruments and policy support activities - This activity will involve the conduct of annual national workshops on RE promotion. *GEF support is not necessary (supported by UNOPS/Nordic Fund).*
- 3.4. Conduct of a study on RE-based Livelihood and Productivity Projects Support Policy – This study will determine and evaluate the potential livelihood support and productivity projects that will utilize electricity from RE-based energy projects. Policy recommendations for the granting of appropriate incentives for such projects will also be formulated. *GEF support is needed for associated technical assistance activities.*
- 3.5. Conduct of a detailed study on energy supply and consumption in Maldives – This activity will involve a survey of energy supply and consumption in the various sectors of the country. An initial detailed evaluation report on the energy supply and end-use consumption in Maldives, including energy demand and energy trends/profiles will be prepared. The initial energy balance of the country will be prepared, which the NEO will update/revise regularly even after the project. *GEF support is needed for associated technical assistance activities (also supported by UNOPS/Nordic Fund).*
- 3.6. Conduct of Integrated National Energy Planning – This activity will involve the provision of technical assistance to the GoM in integrated national energy planning. Existing database, reports and policy documents on the expansion of electrification will be updated. Least cost planning, using appropriate software, geographical information systems, energy and socio-economic statistics, aerial maps and meteorological data will be carried out. The initial National Energy Plan of Maldives will be prepared. *GEF support is not necessary (supported under TTF and UNOPS/Nordic Fund)*
- 3.7. Evaluation of the National Energy Policy Implementation - The impacts of the enforcement of policy; pricing and regulatory measures that are recommended and implemented in order to promote the application of RETs particularly for electrification will be monitored and evaluated. Lessons learned around issues such as incentive mechanisms, further barriers to RET applications, communication and policy strategies will be identified and appropriate actions recommended. *GEF support is required for capacity building activities.*
- 3.8. Conduct of RE Policy review- The RE policy will be reviewed and evaluated based on the results of the demonstration scheme. Revised policy and implementing guidelines covering pricing, incentives, etc. about RE-based off-, and on-grid, power generation will be formulated and recommended for issuance and enforcement. *GEF support is not necessary*

Output/component 4: RE Technical Capacity Building

Other value-added applications of RE resources are assessed, including the viability of a local RE consultancy service industry, capabilities of local engineering and consulting services in the area of RE, and the viability of local manufacturing of RE system equipment and/or components. Local engineering consultants become knowledgeable in the design, feasibility evaluation, maintenance

and operation of RE systems. Proposals for RE-based power system projects are presented to GoM, donors and private investors.

The areas of activity are:

- 4.1. Assessment of Other Value-added Applications of RE Resources - The feasibility and applicability of other uses of the country's RE resources will be assessed. Individual evaluation reports and project recommendations for each potential use of RE resources will be prepared. *GEF support is needed for associated technical assistance activities.*
- 4.2. Evaluation of the viability and the requirements for the development of a local RE Consultancy Service Industry - The feasibility of developing a consultancy and engineering service industry in the Maldives that can provide technical and maintenance services for RE-based energy systems will be studied. *GEF support is needed for associated technical assistance activities.*
- 4.3. Assessment of Local Capabilities for the Provision of RE Services - This activity will involve the evaluation of the capabilities of local firms (e.g., work shops, industrial manufacturing) in performing technical and maintenance services for RE-based energy systems. It will also include capacity building for local engineering consultants in providing services on RET. This industry is expected to develop and provide the technical services associated with the design, installation, and maintenance and troubleshooting of RE-based energy systems. *GEF support is needed for associated technical assistance activities.*
- 4.4. Assessment of the Viability of Local Manufacturing of RE System Equipment and/or Components - This activity will involve the evaluation of the feasibility of, and requirements for developing an industry/business for the local manufacture of RE-based system equipment and/or components. Assessment reports highlighting findings and recommendations will be prepared. *GEF support is needed for associated technical assistance activities.*
- 4.5. Design and conduct of Training Course on the Design, Feasibility Evaluation, Operation and Maintenance of RE Systems (electricity and non-electricity) - This capacity building activity will involve the provision of comprehensive training courses on high efficiency design, economic feasibility evaluation, operation and maintenance of RE-based energy systems for potential local engineering consultants and RE system equipment suppliers. *GEF support is required for capacity building activities.*
- 4.6. Design and initiation of a Sustainable RE System R&D Program - This activity will involve the design and development of sustainable RE R&D program supported initially by the government and later also by the private sector. The R&D efforts may focus on the following areas: (1) Site selection and assessment methodologies; (2) Enhanced resource assessment methodologies; (3) Improved field assessments, including load forecasting, socio-economic, and environmental surveys; and, (4) Improved models for RE Hybrid system models tailored for the Maldives. *GEF support is needed for associated technical assistance activities.*
- 4.7. Formulation of Plans for RE-based Power Generation Projects in OIAs - This activity will involve provision of assistance to the NEO, MAA and the private sector in expanding RE development efforts beyond the project. Project proposals will be prepared for new projects covering project set-up, cost-benefit analysis and financial plan. These proposals will be presented to the GoM, interested investors (local and foreign) and international donors. *GEF support is needed for associated technical assistance activities.*

Output/component 5: RE Project Financing Schemes

Private and government financial institutions, commercial banks, and, private entrepreneurs are trained on RE technology business, financing and economic feasibility evaluation. A RE Fund is established, and a clearly defined financing scheme for utilizing the fund is designed and implemented. RE "One Stop Shop" service of NEO are provided to eligible financing assistance applicants.

The areas of activity are:

- 5.1. Design and conduct of a Training Course on RE Projects and RE-based Livelihood/Productivity Projects Financing - This activity will involve the conduct of training courses on project financing for: (1) private and government financial institutions; (2) commercial banks; and, (3) private entrepreneurs. *GEF support is needed for associated technical assistance activities.*
- 5.2. Establishment of a Fund for RE System Applications (FRESA) in OIAs – This activity will entail the establishment of a financing window (FRESA) for supporting RE-based energy system projects, as well as livelihood support and productive use projects in the outer islands served by such systems. The FRESA will be an expansion of the existing credit facility operated by the Ministry of Atolls Administration. This MAA credit facility has a sub-account specifically for supporting electrification projects (mainly for purchase of portable diesel gensets) in the outer islands. The proposed GEF alternative financing facility (i.e., FRESA) will comprise of the funds in the MAA credit facility sub account and incremental funds for lending to RE-based energy projects. Presently, RE-based energy projects are not funded by the MAA sub-account. *GEF support is required for incremental funds.*
- 5.3. Design and Implementation of FRESA Financing Scheme – The financing scheme that will be used for lending the moneys from FRESA will be designed and implemented under this activity. The design will be based on the review of existing financing schemes in the Maldives¹ as well as the latest international literature and experience on financial mechanisms for RE-based electrification. All feasible modalities for the lending will be evaluated, and an appropriate scheme will be selected and implemented as an expansion of the ongoing MAA credit facility. The design of the appropriate scheme will involve, among others the definition of the loan terms, loan repayment, borrower eligibility criteria, and fund management arrangements. It is suggested that FRESA provides loans to RE projects at market interest rate, as suggested by the BoM, instead of subsidized rates. Another option is for FRESA to finance loans only for RE system equipment purchase. The borrower gets the equipment instead of the loan money to buy the equipment, and pays the loan at the agreed terms. The FRESA fund manager makes the necessary arrangements for the supply of the equipment with local and/or foreign RE equipment suppliers. This second option will help support the development of a RE system equipment market in the country. After approval by the MAA and the Maldives Monetary

¹ There are a number of credit schemes in the country that provides micro-financing to IDCs and individuals in the outer islands. Among these are the credit schemes of the MFAR, BoM and the MAA's UNDP-funded Atoll Development Funds (ADFs). These credit schemes are for supporting development in the OIAs. BoM's credit scheme is for the entire country, while MAA's ADFs are at present in 6 atoll groups. The BoM and MAA credit schemes also cater to loans for diesel generator sets for power generation. Loans from the ADF are at 10% interest, which is below the commercial rate of 12% p.a. BoM lends money at commercial rates. These individual schemes are run according to their own guidelines and conditions of finance. There is no common legal and regulatory framework for micro credit in the country, which results in ad-hoc drawing up of operational procedures for each scheme. The Maldives Monetary Authority with UNDP support under RETDAP will be reforming the micro-financing activities in the Maldives, bringing the currently diverse range of credit lines under one regulatory umbrella and consolidating the range of schemes based on best practices and comparative advantages of the different schemes.

Authority (MMA), the financing scheme is implemented. *GEF support is needed for associated technical assistance activities.*

- 5.4. Provision of Assistance Services to FRESA Financing Applicants - This activity will entail the provision of assistance to entities that will be eligible for FRESA. The assistance also extends to the procurement (if needed by demo host sites) of required hardware for the demonstration projects that will be implemented under this project. *GEF support is not necessary.*
- 5.5. Evaluation of the FRESA Project Financing Assistance Program - The evaluation of the impacts of the financing schemes and the provision of recommended revisions (if necessary) to the relevant policy and implementation guidelines that affects the FRESA financing assistance will be carried out under this activity. *GEF support is not necessary*

Output/component 6: RE System Project Development

Techno-economic feasibility of RE-based energy projects in selected demo sites, including the necessary implementation requirements from the MCST, financing institutions and the national power utility are completed. Baseline performance data and operating performance targets for the planned demo projects are established. Demo plants are constructed and commissioned. Evaluation of operating and economic performances are conducted and documented for dissemination.

The areas of activity are:

- 6.1. Conduct of Techno-economic Feasibility Analyses of Potential RE-based Energy Systems in OIAs – This activity will involve a techno-economic feasibility analysis of potential RE-based energy system projects in the OIAs, including those that could be showcased in the demonstration projects that will be implemented under this component of the RETDAP. *GEF support is needed for associated technical assistance activities.*
- 6.2. Identification and Evaluation of RET Application Demonstration Requirements – In this activity, the selection of the demonstration sites will be finalized. Based on the preliminary findings of the PDF-A exercise, there will be 4 demonstration projects that will be demonstrated: (1) Solar-Diesel Hybrid Power Generation – Part of the electricity supply from diesel generator sets will be displaced by solar PV electricity during times when sunlight is available; (2) Wind-Diesel Hybrid Power Generation – Part of the electricity supply from diesel generator sets will be displaced by wind turbine generated electricity during times sufficient wind energy is available; (3) Solar Dryer – More efficient, productive and hygienic solar dryer for fish and/or agricultural crop products; and, (4) Household Biogas Digester – Biogas generated from kitchen and agricultural waste will displace LPG and/or kerosene used for household heating needs.

While the above RETs have already been tried, tested and are widely utilized in some developing countries, the GoM thinks that it is very necessary to demonstrate these technologies as these are not known among the Maldivians. An evaluation of the implementation requirements (e.g., logistical, financial, manpower, technical, legal, etc.) for the demonstration schemes that will be carried out under this component of the RETDAP will also be carried out. *GEF support is needed for associated technical assistance activities.*

- 6.3. Implementation (in conjunction with Item 6.2.) of courses of actions for the removal of barriers to the successful implementation of RET application demonstration schemes - Certain requirements maybe required to facilitate the smooth and effective implementation of the demonstration schemes. Among these is the verification and confirmation of the magnitude and availability of RE resources at the sites. In addition, technical assistance will be provided in the setting up of administration, operation and maintenance systems at the demonstration sites (e.g., designation

of administrator, caretakers/operators; establishing of guidelines and procedures). *GEF support is needed for associated technical assistance activities.*

- 6.4. Establishment of Baseline Data for the RET Application Demonstration Sites - This activity will involve the conduct of electricity consumption and demand surveys, as well as socio-economic conditions at the 4 project sites and baseline performance data. Operating performance targets for the planned projects will also be established. This activity could be carried out in conjunction with Activity 6.1. *GEF support is needed for associated technical assistance activities.*
- 6.5. Design of RET system project in each demonstration site - This activity will involve the provision of technical assistance in the preparation of the demo project basic engineering designs, comprehensive technical, economic and social feasibility evaluations. *GEF support is needed for associated technical assistance activities.*
- 6.6. Implementation of RE demonstration projects – The host demo sites will carry out the tasks involved under this major activity. Technical assistance will be provided, where necessary, in the engineering design, installation, and commissioning of the facilities. *GEF support is needed for associated technical assistance activities.*
- 6.7. Monitoring and Evaluation of the performance of each demonstration project – The operation of the demonstration projects will be monitored (by operators) under this activity. Each project will be evaluated as to their maintenance, management, administrative organization and stakeholder participation in the operation. The evaluation will include the energy and environmental impacts of the project. An evaluation report for each demonstration project highlighting the operating and economic performances, as well as energy savings and GHG emissions reduction will be prepared. This activity will be carried out regularly even after the completion of this project. *GEF support is needed for associated technical assistance activities.*
- 6.8. Evaluation and dissemination of the results of the Demonstration Program - This activity will entail the conduct of an overall performance evaluation of the demonstration program, including the dissemination of program results and recommendations through a national workshop. *GEF support is needed for associated technical assistance activities.*
- 6.9. Design of sustainable follow-up program for RE development - - This activity will involve the design of a sustainable follow-up program for financially supporting the development and utilization of RE resources for electricity and non-electricity purposes in the country. *GEF assistance is not necessary.*

III. RESULTS FRAMEWORK

The project results and resources framework for PEI Phase 2, including outputs and major areas of activity, is presented in the table below. The budget figures reflect the total project budget as presented in Annex 3, excluding global programme coordination inputs.

Project Results and Resources Framework

Intended Outcome:

Improved capacity of local authorities, community-based groups and private sector in environmental management and sustainable energy development

Outcome Indicator:

Pilot programmes to assess the replicability of multi-stakeholder approaches to environmental management and provision of sustainable energy services

Partnership Strategy:

The Ministry of Communications, Science and Technology (MCST) of the Government of Maldives will be the lead partner as the executing agency. Other stakeholders will be consulted in seeking their views and project activities will be coordinated with these stakeholders, including:

- Government bodies,
 - State Electricity Company (STELCO, on RE pilot applications, power statistics and energy surveys),
 - Ministry of Planning and National Development (MNPDP, on implications for national policy),
 - Ministry of Home Affairs, Housing and Environment (MHAHE; GEF focal point, on the linkage with the forthcoming RETDAP proposal),
 - The Meteorology Department (existing wind and solar data and assistance in measurements),
 - Ministry of Finance and Ministry of Foreign Affairs (on matters of foreign aid coordination), and
 - Ministry of Atolls Administration (MAA, on installing measuring equipment, survey organization and community consultation),
 - Ministry of Trade and Industries;
- Non-governmental bodies (e.g., Faculty of Engineering, on organizing tailor-made short courses);
- Private sector, such as private power generators (on pilot applications and future investment in RE development) and, ultimately, the island communities concerned (Island Development Committees).

Intended Outputs	Activities	Inputs and budget
1. RE advocacy and awareness Citizens of Maldives are aware of the benefits of utilizing RE to meet energy needs to sustain national development.	1.1 Establishment of a RE Information Centre in MCST 1.2 Design and conduct of a RE technology education program 1.3 Establishment and implementation of an integrated RE information exchange service 1.4 Conduct of information campaigns on RE technology applications in Outer Islands and Atolls (OIAS) 1.5 Introduction of a "one-stop-shop" service for RE market services	<ul style="list-style-type: none"> • International consultants • National consultants • Travel/DSA • Training and workshops • Equipment • Miscellaneous USD 85,560
2. RE resource assessment Potentials and feasibility of utilizing available RE resources in Maldives are established	2.1 Conduct a RE resource survey 2.2 Development of a RE resource assessment methodology 2.3 Design and development of a RE resource database 2.4 Development of a RE monitoring and simulation methodology 2.5 Conduct a capacity building program on RE resource assessment for relevant government agencies	<ul style="list-style-type: none"> • International consultants • National consultants • Travel/DSA • Miscellaneous USD 20,360
3. RE policy development and institutional strengthening RE development and utilization is integrated into the national energy plans and policies of Maldives	3.1 Strengthening of the newly established National Energy Office (NEO) 3.2 Formulation and implementation of a national energy policy incorporating RE development, utilization and pricing 3.3 Conduct of RE promotion workshops focusing on the relevant policies, policy instruments and policy support activities 3.4 Conduct of a study on RE-based livelihood and productivity projects support policy 3.5 Conduct of a detailed study on energy supply and consumption in Maldives 3.6 Conduct of integrated national energy planning 3.7 Evaluation of the national energy policy implementation 3.8 Conduct of RE Policy review	<ul style="list-style-type: none"> • International consultants • National consultants • Travel/DSA • Training and workshops • Miscellaneous USD 58,580

Intended Outputs	Activities	Inputs and budget
<p>4. RE technical capacity building</p> <p>Capacity and tools to enable the sustained and effective development and utilization of RE resources become available.</p>	<p>4.1 Assessment of other value-added RE resources</p> <p>4.2 Evaluation of the viability and the requirements for the development of a local RE consultancy service Industry</p> <p>4.3 Assessment of local capabilities for the provision of RE services</p> <p>4.4 Assessment of the viability of local manufacturing of RE system equipment and/or components</p> <p>4.5 Design and conduct of training course on the design, feasibility evaluation, operation and maintenance of RE Systems (electricity and non-electricity)</p> <p>4.6 Design and initiation of a sustainable RE system R&D program</p> <p>4.7 Formulation of plans for RE-based power generation projects in OIAs</p>	<ul style="list-style-type: none"> • International consultants • National consultants • Travel/DSA • Training and workshops • Miscellaneous <p style="text-align: right;">USD 121,650</p>
<p>5. RE project financing schemes</p> <p>Appropriate financial assistance mechanisms are set in place to facilitate support for RE-based projects, and ultimately prove the economic viability of such projects</p>	<p>5.1 Design and conduct of a training course on RE projects and RE-based livelihood/productivity projects financing</p> <p>5.2 Establishment of a Fund for RE System Applications (FRESA) in OIAs</p> <p>5.3 Design and implementation of FRESA financing scheme</p> <p>5.4 Provision of assistance services to FRESA financing</p> <p>5.5 Evaluation of the FRESA project financing assistance program</p>	<ul style="list-style-type: none"> • International consultants • National consultants • Travel/DSA • Training and workshops • Micro-credit • Miscellaneous <p style="text-align: right;">USD 256,810</p>
<p>6. RE system project development</p> <p>Techno-economic feasibility of RETs is established, and proposals for RE-based projects in the OIAs are developed.</p>	<p>6.1 Conduct of techno-economic feasibility analyses of potential RE-based energy systems in OIAs</p> <p>6.2 Identification and Evaluation of RET Application Demonstration Requirements</p> <p>6.3 Implementation of courses of actions for the removal of barriers to the successful implementation of RET application demonstration schemes</p> <p>6.4 Establishment of baseline data for the RET application demonstration</p> <p>6.5 Design of RET system project in each demonstration site</p> <p>6.6 Implementation of RE demonstration projects</p> <p>6.7 Monitoring and evaluation of the performance of each demonstration project</p> <p>6.8 Evaluation and dissemination of the results of the demonstration programme</p> <p>6.9 Design of sustainable follow-up program for RE development</p>	<ul style="list-style-type: none"> • International consultants • National consultants • Travel/DSA • Training and workshops • Equipment • Miscellaneous <p style="text-align: right;">USD 182,040</p>

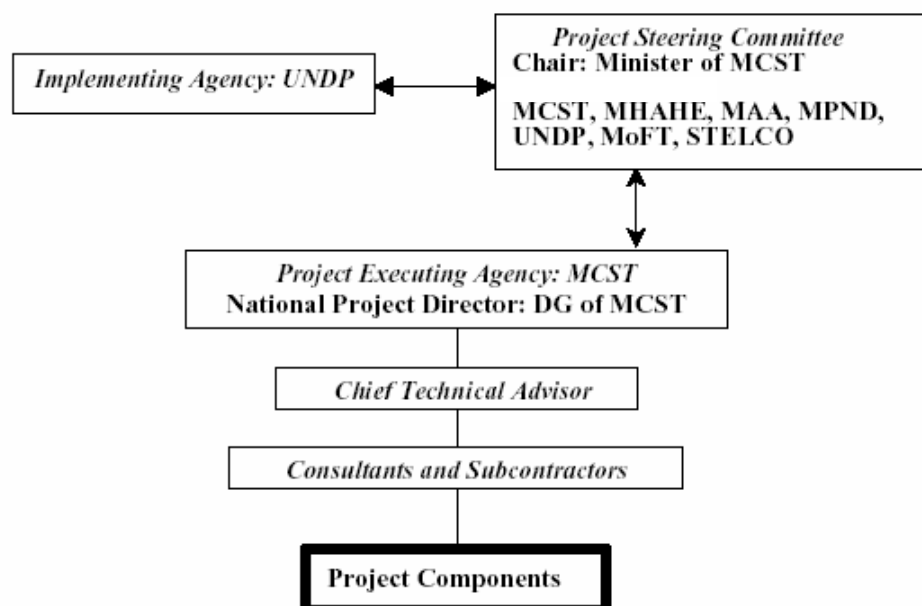
IV. MANAGEMENT AND IMPLEMENTATION

IV.1 Project management

Project Steering Committee

A project steering committee (PSC) consisting of representatives from relevant government agencies involved in energy, environment and climate change, economic development and planning, and possibly the private sector will be set up to be responsible for overall coordination and implementation of the project objectives. The MCST, MAA and the MHAHE, will be among key members of the PSC. Other committee members will include the UNDP country office and other relevant groups, such as the project leaders of the RE resource assessment project and the NEO development project. It will be chaired by the Minister of MCST.

The organizational chart for the project implementation is as follows:



Project Management Office

The MCST will have principal responsibility for project management and operational coordination of the RETDAP. The Director General of MCST will be designated as the National Project Director (NPD). The NPD will supervise activities, ensure the timely provision of government inputs and be responsible to the Government and UNDP for the achievement of results and outputs of the RETDAP. Project coordination activities with all national and international related projects, including the UNDP-TTF/UNOPS Nordic Fund RE Resource Assessments and the ESCAP-funded NEO Development will be the responsibility of the MCST.

A nationally recruited Chief Technical Adviser (CTA) will work full time in the coordination. The CTA will be working closely with the NPD in advocating for RE issues at the ministry level. The CTA will be responsible to the PSC and the project stakeholders. He/She will also be responsible to the NPD for the achievement of project development objectives and for all reporting, including the submission of work plans and financial reports. The project will be executed fully in line with UNDP national execution procedures, as detailed in the NEX Manual. The CTA will manage and coordinate the project activities among all relevant stakeholders, including interested national

organizations and NGOs. He/She will work and liaise closely with the UNDP country office in Male'. He/She will facilitate and provide guidance in the conduct of the project activities, as well as overall direction to the international and national consultants working on the project.

IV.2 Project stakeholders and public involvement

The project stakeholders include government agencies, particularly the MCST and the MAA and private sector participants. A strong stakeholder involvement from the people in the outer island communities, and the IDCs is essential to the success of the project. The project will be executed by the MCST in close coordination with the MAA, which is the government agency that is closely involved with the people in the outer islands. The barriers to RE development and application in the country cannot be removed without a high degree of participation from the project stakeholders. With stakeholder participation, RE will receive wide recognition and support. The project stakeholders and their specific roles are described below:

- Government of Maldives – The GoM will provide logistical support to the project. Staff members from the MCST and other relevant government department/ministry will be seconded to the project, along with material support such as office space, use of equipment and transportation. The GoM shall also play a key role in implementation of the technical capability building of internal personnel.
- NGO and Island Communities – A key NGO or local, community-based organization will be identified to assist in the implementation of public awareness and productive-use components of the project. The NGO or local group will provide input in assessing the awareness level and attitude towards electrification and RE particularly in determining the type(s) of public awareness campaign to be developed. They will also assist in identifying the types of productive-use projects to undertake and the appropriate group or organization to undertake the project.
- Private Sector – RETDAP will target the relevant entities in the private sector, and therefore find ways of involving the private sector in the RE development efforts in the country. The project will identify and consult with the private companies who might be interested in venturing in RE system products and services business. It will also identify possible interventions (e.g., policy, lack of awareness or misunderstanding) to encourage private sector involvement in the RE development efforts in the country. Private organizations could also be involved in updating data in the information exchange network. Periodic meetings with the participants will ensure adequate service capability of the network.
- International Organizations - The project will also seek to establish links with RE information providers, including RET developers and providers in the region and in other parts of the world. These organizations can also be involved in the RETDAP execution.
- Bank of Maldives – This is eyed as the fund manager for the RE financing scheme that will be developed, established and operationalized under the project. It has nationwide presence, and has the logistical resources needed in the monitoring of loans, as well as collection of loan repayments. Regional offices of BoM in the project areas will also be involved in the financing aspects of RE project activities.
- Local CBOs and NGOs working in the project area will conduct field level operations as rural electrification service providers to the households in the community. The CBOs and NGOs are expected to play a key role in providing awareness and maintenance training during the project period, and above all operate as a co-coordinating body between the rural community and the implementing agency.
- State Electricity Company (STELCO) – This is a wholly owned state company and is regarded as the national power utility company. It operates several power plants in various outer islands. It will participate in the demo schemes showcasing solar-diesel hybrid systems, and wind-diesel hybrid systems, contributing the baseline funds for the diesel component of the demo scheme. Its technical staff will also be trained under the RETDAP.
- Island Development Communities (IDCs) and Private Power Generators (PPGs) – These provide electrification service to the households in some of the outer islands not served by STELCO. In order

to enhance their capabilities in using alternate technologies for electrification, relevant staff of these entities will participate in the RETDAP training programs. Site identification for RETs electrification will be done in consultation with the existing plan of the IDCs and PPGs.

IV.3 Project information dissemination

The RETDAP will involve information dissemination and public awareness enhancement activities, in the form of public exhibitions, multi-media presentations, dissemination of public information, and conduct of training courses, seminars and workshops. The project will involve consultation with a broad cross-section of people, in the policy studies, and assessment of the extent of barriers/issues, as well as determine needs in the area of RE development. This gives the opportunity to consult fully with representatives of all stakeholders.

IV.4 Monitoring and Evaluation

The project will be monitored and evaluated following UNDP-GEF rules and procedures. The Executing Agency (MCST) will be required to prepare quarterly and annual work plans and to report to UNDP on progress in achieving targets. Quarterly Progress Reports (QPRs), which provide a brief summary of the status of input procurement and output delivery, explain variances from the work plan, and present work plans for each successive quarter for review and endorsement will be prepared by the MCST. The project will also be subject to annual Project Implementation Reviews (PIRs). The PIR would provide a more in-depth summary of work-in-progress, measuring performance against both implementation and impact indicators. A terminal report would be completed prior to the completion of the project detailing achievements and lessons learned. It is through these reports that the project approach and activities will be formally refined if necessary.

MCST will carry out continuous self-monitoring. The project will coordinate with the MAA, as well as the IDCs, STELCO and the relevant project partners the continuous monitoring of the status of specific project activities during and where possible, even after the RETDAP implementation. The continuous monitoring and evaluation of the project sites, even after completion of the project period, will bring sustainability of the project with desired benefits in the long run.

The Project Framework Design (i.e., Planning Matrix) in Annex 2 states all the success indicators and objectively verifiable indicators for each project activity. These indicators, which will be reviewed for their practicability and completeness prior to project implementation, are the parameters that have to be monitored by the MCST under this project. The annual growth in installed RE-based energy systems in the country provides a clear indication of the realization of the project's purpose. As such, this is one parameter that has to be monitored and evaluated during the course of project implementation. The extent by which the GEF developmental goal is achieved can be evaluated from the monitored results. The annual target values for the indicators will be agreed upon during project document finalization.

The project will be subjected to two mandatory independent evaluations. The first evaluation will be conducted during the 4th quarter of Year 2. A second and final evaluation will be scheduled upon project termination and UNDP, may, at its discretion, schedule additional independent evaluations if deemed necessary.

Monitoring and evaluation of all the demonstration sites will be carried out by NEO/MCST. The evaluation reports will be uploaded at the web site of NEO/MCST, and published for widespread dissemination.

IV.5 Risk analysis and sustainability

Risks

While all efforts have been made to ensure the effective design and implementation of RETDAP, there are some risks that have to be addressed in order to ensure success of the project. The different risks that were identified during the project formulation and the recommended mitigation measures are presented below.

Risk	Level of Risk	Mitigating Measures
Project is not implemented on time	Low	Clearly defined roles will be established and agreed upon by the stakeholders during the LPAC meeting; Identifying project team members, and preparations for hiring of experts will be carried out even before ProDoc signing; and, immediate mobilization of project team after ProDoc signing.
Poor coordination among the key stakeholders.	Medium	Appropriate institutional arrangement with clearly defined roles of the key organizations and individuals will reduce the risk of project failure.
RET hardware used in demo projects fail due to procurement of inferior quality products.	High	Internationally recognized RET hardware/components will be procured (with the required warranties and TA from the supplier).
Poor coordination and inadequate attention to the maintenance and operation of the RE demonstration units may result in premature failure and discontinued service for the beneficiaries.	Medium	Adequate supervision of the design and implementation of the RE demo schemes will be ensured. MOA will be signed between the NEO and demo site hosts to ensure proper operation, monitoring and evaluation of the demo projects.
RE fund borrowers delayed or defaulting in their loan repayments.	Medium	Proper evaluation of loan applications and credit worthiness of borrowers will be ensured. Fund manager will be required to ensure loan repayments.
RE plan for cost recovery due to improper financial analysis can result in failure of the project.	Medium	Detailed business plan will be worked out to recover costs under Component 3.
Natural calamities damage RET components in the resource assessments and RET demo projects.	Low	Special care will be taken in the installation of RET components.
Overall	Medium	

Sustainability

The utilization of RE resources is considered as one of the effective ways of achieving sustainable development. Almost all developed countries and many developing countries have included RE among the important sources of energy in their energy planning. Significant technological advances have already been achieved in the area of RE applications. For countries like the Maldives, which is comprised of many scattered island areas that need electrification, RE-based power systems are far more adaptable and well suited as a form of decentralized alternative energy system.

The deliverables from this project will help facilitate the creation of the enabling environment conducive to implementation of future RE development efforts, whether these are in the policy, regulatory, financial and technical aspects. Information, practices, techniques and experience/lessons learned from the activities that will be carried out will be utilized or adopted by the relevant people in the GoM, thereby planting the initial seeds for enhanced capacity in the areas of energy (particularly RE) planning and policy making. The project will also initiate enhanced demand and interest for sustainable RE initiatives/ventures.

RETDAP will demonstrate the technical, financial and commercial viability of applicable RETs for outer islands in the Maldives. It will also build up in-country capacity energy policy making and planning, as well as technical capacity for the installation, operation and maintenance of RE-based systems. It is expected that the capacity building and enabling activities that will be implemented under the project will enhance the demand and confidence in the technology. These will be secured through the public awareness and information dissemination activities of the project.

From a financial standpoint, the project will ensure that interventions designed to support the financial viability of RE projects will be developed. RETDAP will formulate financial incentives for RE development activities. From the consumers' perspective, RETDAP will come up with inputs to the development of schemes that will provide technical assistance to identify opportunities for economic use of RE services. The potential users of RETs will be assisted through one of the country's development credit schemes that will be supplemented with a fund for financing RE-based projects in the outer islands. The financial assistance scheme that will be established and operated will be designed to revolve and grow to assist future replication of the demonstrated RETs.

RETDAP in itself will be sustained with the follow up programs that will be designed and develop towards the end of its implementation using the relevant outputs from the various project components. In that sense alone, this particular project is sustainable.

V. LEGAL CONTEXT

This programme document shall be the instrument referred to as such in the Standard Basic Assistance Agreement between the Republic of Maldives and the United Nations Development Programme. The host country implementing agency shall, for the purpose of the Standard Basic Assistance Agreement, refer to the government cooperating agent described in that Agreement.

The following types of revisions may be made to this programme document with the signature of the UNDP Resident Representative only, provided he or she is assured that the other signatories of the programme document have no objections to the proposed changes:

- Revisions in, or addition of, any of the annexes of the programme document;
- Revisions which do not involve significant changes in the immediate objectives, outputs, or activities of a programme, but caused by the rearrangement of inputs already agreed to or by cost increases due to inflation; and
- Mandatory annual revisions which re-phase the delivery of agreed programme inputs or increased expert or other costs due to inflation or take into account agency expenditure flexibility.

The administration of this project shall be governed by UNDP rules and procedures as defined in the Programming Manual. The UNDP Country Programme for Maldives (2003-2007) submitted to and approved by the UNDP Executive Board in their second regular session of 2002, shall guide the implementation of this programme. The full text of the Country Programme can be found at www.mv.undp.org

Audit Clause

The Government will provide the Resident Representative with certified periodic financial statements, and with an annual audit of the financial statements relating to the status of UNDP (including GEF) funds according to the established procedures set out in the Programming and Finance manuals. The Audit will be conducted by the legally recognized auditor of the Government, or by a commercial auditor engaged by the Government.

VI. INPUTS AND BUDGET

VI.1 Budget of UNDP/GEF-funded inputs

Project number: MDV/03/G35/A/1G/99

Project title: RETDAP

Management Arrangement: National Execution

Designated Institution: GoM-MCST

Revision code: A

Source of funds: GEF

CMBL	Description	Implem agent	TOTAL		2004 ^(d)	2005	2006	2007
			w/m	USD	USD	USD	USD	USD
10	PROJECT PERSONNEL							
11	International Personnel							
	Consultants							
11-01	Sustainable energy policy	NEX	3.0	32,709	10,000	10,000	8,000	4,709
11-02	RE systems and technical capacity building	NEX	5.5	60,746	10,000	20,249	20,249	10,249
11-03	RE project financing mechanisms	NEX	1.2	13,145		3,500	6,573	3,073
11-99	Subtotal		8.5	106,600	20,000	33,749	34,821	18,030
15	Monitoring and Evaluation	NEX		21,750				21,750
16	Mission costs							
16-01	Consultants ^(b)	NEX		100,800	18,912	31,912	32,927	17,049
16-02	Training abroad	NEX		76,000	18,000	28,000	20,000	10,000
16-99	Subtotal			176,800	36,912	59,912	52,927	27,049
17	National Professionals							
17.01	CTA - project manager	NEX	36.0	43,200	8,000	14,400	14,400	6,400
17.02	Information and awareness	NEX	2.7	2,500	650	900	600	350
17.03	Energy demand and policy	NEX	3.2	3,000	750	1,100	750	400
17.04	RE systems	NEX	9.1	8,500	1,500	2,833	2,800	1,367
17-05	Financing and small credit	NEX	2.1	2,000		500	1,000	500
17-99	Subtotal		51.0	59,200	10,900	19,733	19,550	9,017
19	<i>Component total</i>			364,350	67,812	113,394	107,298	75,846
20	CONTRACTS							
21	Demo projects evaluation	NEX		11,210				11,210
29	<i>Component total</i>			11,210	0	0	0	11,210
30	TRAINING ^(a)							
31	Study tour							
31-01	RE systems and technology	NEX		10,000	5,000	5,000		
32	Short courses and workshops ^(c)							
32-01	Kick-off workshop	NEX		2,970	2,970			
32-02	RE OIA info campaign	NEX		3,900	1,800	2,100		
32-03	Energy policy workshops	NEX		8,000	2,000	4,000	2,000	
32-04	Courses, workshops on RE systems and technology	NEX		23,950		7,500	12,000	4,450
32-05	Courses, workshops on energy project financing	NEX		5,000		2,500	2,500	
32-06	Course/seminar RET demo projects	NEX		5,000		2,500	2,500	
32-07	Nat. workshop results of demo projects	NEX		3,000				3,000
32-99	Subtotal			51,820	6,770	18,600	19,000	7,450
39	<i>Component total</i>			61,820	11,770	23,600	19,000	7,450
40	EQUIPMENT							
45-01	Non-expendable (office supplies)	NEX		3,620	1,800	1,820		
45-02	Non-expendable (demo projects)	NEX		30,000		7,500	15,000	7,500
45-99	Subtotal			33,620	1,800	9,320	15,000	7,500
49	<i>Component total</i>			33,620	1,800	9,320	15,000	7,500
50	MISCELLANEOUS							
52	Reporting and office management costs	NEX		29,000	5,000	9,667	9,667	4,667
59	<i>Component total</i>			29,000	5,000	9,667	9,667	4,667
70	MICRO-CREDIT							
72	FRESA credit facility	NEX		225,000		100,000	125,000	
79	<i>Component total</i>			225,000	0	100,000	125,000	0
90	TOTAL							
99	Project total			725,000	86,382	255,981	275,964	106,673

^(a) Excluding cost of travel abroad

^(b) Cost of international and domestic travel of foreign experts

^(c) Held locally or abroad

^(d) Assuming GEF activities start in second trimester of 2004

VI.2 UNDP, Government and other inputs

The total GEF contribution is USD 725,000 provided through the facilities of the UNDP as a GEF implementing agency. The detailed UNDP-format budget is listed in section VI.1. Budget details on non-GEF (baseline) sources of funding and co-financing is presented in section VI.3.

UNDP-GEF inputs

International consultants

TORs for these positions are provided in Annex 4. Payment for international consultants will include the consultant's fees. The total budget for international consultants is USD 106,600.

- Sustainable energy policy
- RE systems and technical capacity building (3)
- RE project financial mechanisms

Monitoring and evaluation

This includes the cost of project evaluation missions. The total budget for the component is USD 21,750

Mission cost/duty travel

This component will cover travel costs (DSA, international tickets) for international consultants. It includes also travel-related cost of training and abroad. The total budget is USD 176,800

National consultants

TORs for these positions are provided in Annex 4. The input of the chief technical advisor (CTA) is a total of 36 months (equal to the project duration). Payment for international consultants will include the consultant's fees. The total budget for consultants is USD 59,200.

- Information and awareness
- Energy demand and surveys
- RE systems
- Financing and small credit

Subcontract

A subcontract is for the 'evaluation of the performance of demo projects' (activity 6.7). The TOR is given in Annex 5. The total budget for the subcontract is USD 11,210.

Training

The project will support in-country training seminars and workshops, as well as an international fellowship/study tour. The training costs will include, hiring translators, renting rooms and other organizational cost, as well as preparing training materials. The total budget for training is USD 49,820.

Equipment

The project will provide non-expandable equipment for the CTA and RE information centre (cost of a computer and fax-printer-copier machine), as well as advanced measurement and other equipment needed for the establishment of baseline data, engineering design and monitoring and evaluation of the demonstration projects. It also includes computers and software needed for survey analysis, database management and geographic information systems (GIS). The total budget for equipment is USD 33,620.

Miscellaneous (project office management)

Administrative and other costs will be incurred in the implementation of the project. These include preparation of required reports and sundries. Apart from this a budget is established for UNDP public information activities related to the project. The total budget for miscellaneous is USD 29,000.

UNDP co-financing

UNDP Maldives commits USD 369,000 to support activities of RETDAP. The co-financing breaks down as follows:

1. UNDP Energy TTF (USD 94,000) for energy resource assessment and advocacy and awareness activities. The Energy TTF project document is attached to this document as Annex 5.
2. UNOPS-executed international consultancy (USD 175,000) for resource assessment and sustainable energy policy development. The UNOPS-Nordic Funds project document is attached to this document as Annex 6.
3. TRAC money, of which, USD 50,000 in cash for the demonstration of a solar-hybrid system, and USD 50,000 to study the micro finance schemes in the country such as that supported by UNDP Atoll Development project and work to strengthen the overall micro-financing system of the country.

Government inputs

The Government of Maldives will provide USD 350,780 co-funding to this project, including USD 20,000 in cash and USD 330,780 in-kind.

The cash contribution of the Government of Maldives will cover:

- USD 20,000 for the implementation of the RE information centre (office equipment, such as computers, printers, audio-visual and communication equipment, and meetings, workshop and other information dissemination events).

The in-kind contributions of the Government of Maldives include the following:

- Salaries, allowances, and time of MSCT personnel involved in the project (other than the CTA and national consultants to be hired for the project);
- Office space and some office supplies for the PMO;
- Office space for the National Energy Office (NEO) and its RE information centre;
- In-country mission support for project related staff and sea and air transport services;
- Administrative support for project related staff, rent for office and meeting room, water, electricity, sanitary management charges, and various kinds of depreciation charges of office equipment;
- Baseline costs involved in:
 - The design and implementation of the 'one-stop-shop' for RE market services;
 - The design, implementation and evaluation of the integrated national energy policy
 - The provision of assistance to FRESA financing applicants and the evaluation of the FRESA programme;
 - The design of a follow-up programme for the development and utilisation of RE resources.

Other contributions

The total capital investment cost for the demonstration projects is estimated to be around USD 1.164 million, including cost of installation. The State Electric Company (STELCO) is committing USD 1.16 million over a 4-year period to support future outer island electrification projects and to use these installations as baseline for demonstration projects. Guarantee Fiberglass Fabrication (GFF) is committing USD 4,000 over a 4-year period. The Ministry of Atoll's Administration (MAA) is committing USD 130,000 for island electrification funds to use these funds as baseline for RETDAP over a 4-year period.

UNITED NATIONS DEVELOPMENT PROGRAMME

Project Summary

PIMS Number: 2131

UNDP Project Number: MDV/03/G35/A/1G/99

Project Title: Maldives: Renewable Energy Technology Development and Application Project (RETDAP)

Duration: 4 years

Estimated starting date:

Management arrangement: National execution (NEX)

Designated institution: Ministry of Communications, Science and Technology (MCST)

Country and project site: Maldives

GEF focal area: Climate change

GEF Operational Program: OP 6: Promotion of the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs

GEF Strategic Priority: CC-2: Increased Access to Local Sources of Financing for Renewable Energy and Energy Efficiency

UNDP and cost-sharing inputs

UNDP:		
GEF	USD	750,000
TRAC	USD	50,000
Energy TTF	USD	94,000
Nordic Fund	USD	175,000

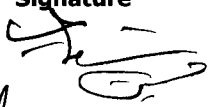
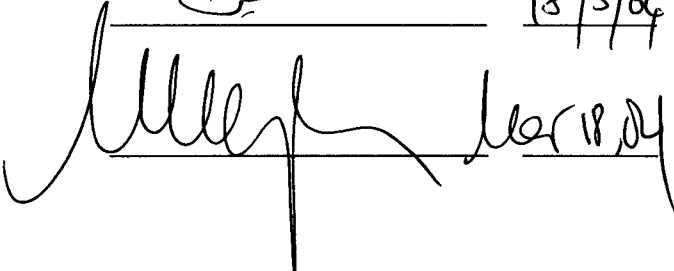
Parallel and co-financing:		
Government	USD	20,000
MAA	USD	130,000
STELCO	USD	1,160,000
GFF	USD	4,000
TRAC	USD	50,000

In-kind:		
Government:	USD	330,780
TOTAL	USD	2,763,780

Summary:

The development goal of the proposed project is the reduction of the growth rate of GHG emissions from fossil fuel using activities, particularly diesel power generation through the removal of the major barriers to the development and application of renewable energy-based systems that can supplant part of the fossil fuel use in the Maldives. The project will quantify and evaluate the potentials of available renewable energy (RE) resources in the country for electricity and non-electricity applications.

The Renewable Energy Technology Development and Application Project (RETDAP) will facilitate the promotion of the widespread implementation and ultimately, commercialization of RE technologies (RETs). The project seeks to establish an environment conducive to the adoption and commercialization of RETs in the country. It involves the design, development and implementation of appropriate policies, strategies and interventions addressing the fiscal, financial, regulatory, market, technical and information barriers to RE development and utilization. It will also involve the development of interventions for strengthening of the relevant institutional structures and national capacity for the coordination and the sustainable management of RE initiatives in the country. RETDAP also involves capacity building activities for enhancing the country's capability in establishing workable and viable schemes for supporting RET applications with emphasis on the design, development, financing, implementation and management of such RE projects, taking into consideration relevant lessons from past RE projects in other Small Island Developing States (SIDS).

On behalf of	Signature	Date	Name/Title
Government:		18/3/04	Mr. Hussain Shihab, Deputy Minister, Ministry of Foreign Affairs.
UNDP:		18/3/04	Mr. Minh H. Pham, Resident Representative, UNDP.

ANNEX I. INCREMENTAL COST ANALYSIS

Incremental cost matrix

Particulars	Baseline	Alternative	Increment (Alternative - Baseline)
Global environmental benefits	<ul style="list-style-type: none"> Maldives presently depend on fossil fuels to meet its energy (bulk of which is electricity) will continue with very minimal concern and efforts in the use of other alternative cleaner and environment friendly energy forms like RE. The dominance of fossil fuels in the country's energy mix points to the clear global significance of removing barriers to RE development and utilization in the Maldives. 	<ul style="list-style-type: none"> The country's capacity in energy planning is increased and the capability to effectively and sustainably explore and exploit RE resources is enhanced. Continuous efforts to address the issues and barriers to RE development and application are carried out to counter the heavy reliance on fossil fuels through promotion and facilitation of the widespread use of RE. RE-based energy projects are designed, financed, and implemented bringing about tangible reduction of fossil fuel consumption and associated GHG emissions. Financing support is provided to RE-based energy project developers and implementers. 	<ul style="list-style-type: none"> Assessment of the extent of realistically achievable RE potentials Implementation of RE-based energy systems project primarily for showcasing the design, financing and implementation of such projects, and how these will reduce fossil fuel and associated GHG emissions. Financing of RE-based livelihood projects in the OIAs, which will bring about reduction in fossil fuel usages and GHG emissions
Domestic benefits	<ul style="list-style-type: none"> Economic development planning in the country will continue to be geared towards fossil fuel use, and substantial efforts to explore and exploit RE resources will not be carried out. 	<ul style="list-style-type: none"> The GoM and the Maldivians are able to understand and come up with realistic and achievable plans and programs in promoting and supporting the widespread utilization of their RE resources. GoM's plans and programs on sustainable development is enhanced through the inclusion of productive uses of RE for improving the livelihood of the population in OIAs. The citizenry become more aware and informed about the potentials and benefits that can be derived from RE as well as the various options ensuring sustainability of RE-based energy systems. Increased public interests and demand for RE. Improved RE information would become available. 	<ul style="list-style-type: none"> GoM becomes aware and understands how the benefits of RE can be put to good use in improving the people's livelihood. Improved coordination and cooperation among the relevant government agencies in carrying out initiatives towards RE development. Increased efforts to enhance public awareness and information about the potentials and benefits of using RE for productive activities.

Component	Baseline Costs	Alternative Costs	Incremental Costs
1: RE Advocacy & Awareness	108,900	194,460	85,560
2: RE Resource Assessment	230,080	250,440	20,360
3: RE Policy Dev't & Inst'l Strength'g	103,580	162,160	58,580
4: RE Technical Capacity Building	18,570	140,220	121,650
5: RE Project Financing Schemes	209,930	466,740	256,810
6: RE System Project Development	1,342,720	1,524,760	182,040
Total	2,013,780	2,738,780	725,000

Incremental cost

Introduction

The development goal of the proposed project is the reduction of the annual growth rate of GHG emissions from fossil fuel using activities, particularly diesel power generation, through the removal of the major barriers to the development and application of renewable energy-based systems that can supplant part of the fossil fuel use in the Maldives. The project will quantify and evaluate the potentials of available renewable energy (RE) resources in the country that can be developed and used cost-effectively for both electricity and non-electricity applications. It seeks to establish an environment conducive to the adoption and commercialization of RETs in the country.

Baseline scenario

The Maldives is currently heavily dependent on fossil fuels, with petroleum products practically accounting for 100% of the energy consumption. Electricity is mainly supplied through diesel-fired power generation units. The present dependence of the country on fossil fuels to meet their energy is expected to continue unless other alternative cleaner and environment friendly energy forms like RE are widely used. Economic development planning would continue to be geared towards fossil fuel use, despite the fact that the Government of Maldives (GoM) has already committed itself, through the Ministry of Communications, Science and Technology (MCST) to promoting the development and use of available RE resources in the country. MCST is now actively pursuing RE resources assessments and establishing of an agency that will look after energy matters in the country. This is the "business-as-usual" scenario, wherein bulk of the electricity and non-electricity operations in the country will still be based on fossil fuels. This is mainly because various barriers and issues are hampering the prospects of sustainable RE development and utilization in the country.

Global environment objective

Maldives practically utilizes imported petroleum fuels to meet almost all of its energy needs, particularly DFO for power generation. This situation has special implications to global GHG emissions. The dominance of fossil fuels in the country's energy mix points to the clear global significance of removing barriers to RE development and utilization. However, although the Maldives is expected to continue to rely on imported fuels for most of its energy needs, available RE forms such as solar, wind, and biomass are recognized as potential energy alternatives. Whether used in stand-alone or in hybrid systems for electricity and non-electricity uses, these energy forms can displace part of the present imported fossil fuels that are used in the country. In line with the objective of mitigating climate change caused by the emission of GHGs from fuel use, the utilization of available RE resources will contribute to meeting the country's long-term energy requirements.

Alternative scenario

The proposed GEF-supported alternative to the "business-as-usual" scenario is the creation of an enabling environment that will facilitate RE development and application in the Maldives, which will contribute to the realization of the country's sustainable development objectives and its goal of reducing the annual growth rate of GHG emissions. Despite the present attempt of the country to develop its RE resources, there are various barriers that hinders the GoM in pursuing the development and utilization of its RE resources. The RETDAP is designed to address the identified barriers to RE development and applications in the Maldives, seeking to remove them in order to facilitate the widespread utilization of RE resources in the country. This is in line with the GoM's aim of utilizing RE resources for national sustainable development. Overall, the RETDAP would contribute to, at least in the reduction of the growth rate of GHG emissions from the diesel-based power generation in Maldives. The success of the project will encourage the widespread application of RE technology not only to meet the electricity needs of the country but also provide the other energy requirements in the other major sectors of the national economy.

The RETDAP will comprise a range of interventions that will address major specific policy, institutional, information, financing, and technical barriers that currently exist. It is comprised of six (6) components

that will address in an integrated manner the existing barriers to RE development and utilization in the Maldives. Component No. 1 will involve the implementation of activities that will remove the information and advocacy problems/issues of RE development and applications. Component No. 2 will involve RE resource assessments addressing the barrier of lack of reliable information on the RE potentials of the country. The third project component (No. 3) will address the policy/regulatory and institutional barriers to RE development. This is followed by a project component (No. 4) that involves the implementation of RE training programs to address technical barriers in the design and operation of NRE systems and system components. Component No. 5 addresses the barriers associated to financing of RE projects. The last project component (No. 6) covers a demonstration program that will involve the showcasing the development and implementation of RE-based energy projects, showing how such projects are designed, financed, implemented and sustainably operated and maintained.

CO₂ emission reduction estimates

The expected widespread utilization of RE in the Maldives during the course of, and after, the RETDAP implementation, will bring about reduction in greenhouse gas (GHG) emissions, particularly CO₂ due to displacement of fossil fuel usage. Bulk of these CO₂ emissions will come from the displacement of Diesel Fuel Oil (DFO) that is used for power generation, as DFO is the sole type of fuel that is used for power generation in the country. Based on historical DFO consumption of STELCO power plants, and taking note of the DFO consumption of the resort islands, fisheries industries, and other power generation entities in the outer islands, forecasts of fuel consumption for power generation for the period 2003-2010 were made. Bulk of the DFO consumption in the country is for power generation. Two sets of values are shown in Table 1, business-as-usual and RE scenario. The former describes the fuel consumption trend as it is at present. The latter describes the scenario wherein RE-based power generation systems (stand-alone and/or hybrid) are in operation in the country. Trend analyses of historical fuel consumption data were done to come up with the forecast periods, considering other factors such as GDP and population growth rates, and the estimated replication of RE-based power generation projects.

Forecast fuel (DFO) consumption in power generation (2003-2010)

Year	Business-as-usual	Fuel consumption	% reduction
2001	70,443	70,443	0.0
2002	76,772	76,772	0.0
2003	81,664	81,317	0.4
2004	87,615	86,456	1.3
2005	94,000	91,596	2.6
2006	100,849	96,735	4.1
2007	108198	101,875	5.8
2008	116083	107,014	7.8
2009	124,542	112,153	9.9
2010	133,617	117,293	12.2

Sources: STELCO and STO

The reduction in DFO consumption due to displacement by RE resources (e.g., solar and wind) results in CO₂ emissions reduction. The amount of CO₂ emissions reduction is computed using the formula:

$$tCO_2 = 3.667 \times 10^{-6} * m_f * HV_f * CEF_f * X_c$$

- tCO₂ = ton CO₂
- m_f = fuel quantity, kg or lit
- HV_f = fuel heating value, MJ/kg or MJ/lit
- CEF = carbon emission factor, tC/TJ
- X_c = oxidized carbon fraction

For diesel fuel oil: HV = 38.99 MJ/lit; CEF = 20.2 tC/TJ; and $X_c = 0.99$

The following table summarizes the CO₂ emissions considering the business-as-usual scenario and the RE scenario.

CO₂ Emissions from Power Generation (2003-2010)

CO ₂ Emissions, tons				Annual Growth Rate, %		
Year	Business-as Usual	RE Scenario	% Reduction	Business-as Usual	RE Scenario	Reduction
2001	201,412.9	201,412.9	0.0%	--	--	
2002	219,509.3	219,509.3	0.0%	9.0%	9.0%	
2003	233,497.8	232,503.7	0.4%	6.4%	5.9%	
2004	250,512.7	247,198.7	1.3%	7.3%	6.3%	
2005	268,767.6	261,893.7	2.6%	7.3%	5.9%	
2006	288,352.6	276,588.7	4.1%	7.3%	5.6%	1.7%
2007	309,364.9	291,283.7	5.8%	7.3%	5.3%	2.0%
2008	331,908.2	305,978.8	7.8%	7.3%	5.0%	2.2%
2009	356,094.3	320,673.8	9.9%	7.3%	4.8%	2.5%
2010	382,042.9	335,368.8	12.2%	7.3%	4.6%	2.7%

By the end of the 4-year RETDAP (i.e., 2007, assuming starting Jan 2004), an estimated 5.8% reduction in CO₂ emissions would be realized from the use of RE for power generation, as compared to when all DFO-based power generation is in place. By 2007, the annual growth rate of CO₂ emissions from power generation in the RE scenario would be 2% lower than when all electricity production in the country is generated using DFO.

LPG and kerosene used in households for cooking are the other petroleum product consumptions that can be displaced with RE. There are very limited data on LPG and kerosene consumption in households. Based on 1999 data from the State Trade Office (STO), LPG and kerosene supply is 582.4 MT and 5,070 MT. The increasing popularity of LPG for cooking (especially in Male's) will result in the decrease in kerosene consumption. It is estimated that LPG consumption will increase by 18.4% per year (based on a linear trend), and by 2010 the LPG consumption in households will be about 3,600 MT. At this rate of consumption, even if all the LPG is displaced by RE (say biogas), the CO₂ emissions reduction is minimal (10.7 tons CO₂) compared to that from power generation. The kerosene consumption in 1999 translates to 16.1 tons CO₂ emissions, and by 2010, with the substitution of kerosene by LPG in many houses, CO₂ emissions from kerosene use would also be reduced because LPG has less CO₂ emissions than kerosene. Nevertheless, CO₂ emissions reduction from non-use of kerosene are still negligible compared to that from the DFO displaced in power generation.

ANNEX II. PROJECT FRAMEWORK DESIGN

Objectives and outcomes	Success indicators	Means of gauging success (verifiers)	Critical assumptions
Development Goal: The growth rate of GHG emissions from fossil fuel using activities, such as power generation and process/water heating, is reduced through the removal of the major barriers to the development and application of renewable energy (RE)-based systems that can supplant part of the fossil fuel use in the Maldives.	The annual growth rate of GHG emissions from fossil fuel-based electric power generation in the country is reduced by about 2% by the end of the project compared to when no interventions are implemented.	Documentation of annual GHG reductions based on data of annual power generation from installed and operational RE-based power systems.	Monitoring activities under the project on RE-based power generation and RE-based energy systems (non-electricity) are fully supported and implemented.
		Results of survey of energy consumption and energy savings from the operation of RE-based energy systems.	
	The annual growth in installed capacity of RE-based power generation systems in the country is about 2.1% by the end of the project.	Documentation of the annual inventory of RE-based power generation systems installed capacity from the NEO/MCST.	Compliance of RE-based power generation units and users to the reporting requirements of RETDAP to NEO/MCST is assured.
	The electricity demand in the OIAs served by RE-based power generation (stand alone and hybrid) increases by 2.6% per year after the project.	Records of electricity consumption in OIAs	Electricity consumption is metered.
	The annual growth in installed capacity of RE-based energy systems (non-electricity) in the country is about 10% by the end of the project.	Results of survey of energy consumption and energy savings from the operation of RE-based energy systems.	Monitoring activities under the project on RE-based energy systems (non-electricity) are fully supported and implemented
Component No. 1: RE Advocacy and Awareness Enhancement			
Outcome 1: Provision of adequate, affordable, accessible and up-to-date information services, continuing education, and awareness improvement on the application of RE resources.	A sustainable and continuously evolving program of providing RET information services, continuing education, and awareness enhancement, covering the energy applications of RE resources is established & implemented by 3rd yr.	RE Information Center in MCST, RE technology education program, Integrated RE information exchange service, and Information campaigns on RET in OIAs.	The relevant government institutions and target groups will be interested in participating and cooperating in the design, development and implementation of the activities under his project component.
1.1. Establishment of a RE Information Center in MCST	RE Information Center established at the MCST and functioning by yr1.	Documentation on the official inauguration of the RE Information Center.	Information demand regarding RE is significant.
	An average of about 100 guests are served by the RE Information Center each year starting yr1.	Guest book of the RE Information Center, and record of services provided.	Guest book and service logbook are maintained.
1.2. Design and conduct of a RE Technology Education Program	In-house RE technology training course for MCST staff started by yr1.	Documentation of the provision and completion of the RE technology training course.	Relevant personnel are interested and willing in participating in the training and in applying the knowledge/know-how they learn.

Objectives and outcomes	Success indicators	Means of gauging success (verifiers)	Critical assumptions
	Study tour/fellowship program on RE system design and applications for selected relevant government and private sector personnel starting yr2.	Satisfactory report on the RE system design and applications study tour/fellowship program and the documentation of the training course materials.	Relevant personnel are interested and willing in participating in the training and in applying the knowledge / know-how they learn.
	Trained government personnel (particularly the MCST staff) are actively involved on RE development activities in the country starting yr2.	Time sheets or activity reports of personnel working on RE-based project development and implementation.	Project staff prepares time sheets and activity reports.
	About 50 % of the trained private sector personnel engaged in RE-based project development and implementation activities in the country starting yr3.	Documentation of RE-based energy system projects with specific mention of the project designers, developers and implementers, including RE system equipment suppliers and service providers.	Relevant regulations on the certification of RE service providers and system suppliers are enforced, including the declaration of project designers, developers and implementers in the permit applications.
	Comprehensive annual training course (1st quarter of each year) on RE technology for Outer Island and Atolls (OIA) Development personnel successfully conducted.	Documentation of the provision and completion of the RE technology training course.	Relevant personnel are interested and willing in participating in the training and in applying the knowledge/know-how they learn.
	Comprehensive annual training course (1st quarter of each year) on the maintenance and operation of RE systems for OIA people successfully conducted.	Satisfactory report on RE system operation and maintenance training course and the documentation of the training course materials.	Target groups are interested and willing in participating in the training and in applying the knowledge/know-how they learn.
	At least 50% of the trained personnel in the OIAs are managing, operating and maintaining RE-based energy systems starting yr3.	Documentation of RE-based energy system projects with specific mention of the project designers, developers and implementers, including RE system equipment suppliers and service providers.	Relevant regulations on the certification of RE service providers and system suppliers are enforced, including the declaration of project designers, developers and implementers in the permit applications for RE project implementation and RE system operation.
1.3. Establishment and implementation of an Integrated RE Information Exchange Service	A fully functioning information exchange services program is operationalised by yr2.	Documentation of the program operation, services provided, and comments of clients.	There is a continuous demand for technical information on RE technology applications.
	Publication and circulation of a quarterly newsletter containing information gathered through the information exchange service (local/regional) starting 4th quarter of yr1.	Published newsletters distributed to the target readers.	
	Around 10 RE-based energy projects or installations in the country monitored each year by MCST starting yr 2.	Documentation on the monitoring reports.	This will be a regular and continuous activity of the NEO/MCST.
	Profiles of monitored RE-based energy projects / installations in the country prepared and updated annually by MCST starting yr2.	Published articles and/or profiles of RE-based energy projects in the country.	This will be a regular and continuous activity of the NEO/MCST.
	Information materials on RE technology incorporated in the MCST database starting yr2.	Database compiling information on RE technology installed at RE Information Center.	Researchers, scientists, and manufacturers use database.

Objectives and outcomes	Success indicators	Means of gauging success (verifiers)	Critical assumptions
	Subscription of scientific journals on RE Technology is received regularly by the Information Center starting yr1.	Compilation of journals/publications on RE technology.	NEO/MCST will continue the subscriptions even after the RETDAP
	Abstracts/Information Notes on relevant articles on RE Technology are annually prepared by MCST, printed in the newsletter and incorporated in the NEO database starting yr3.	Compilation of abstracts and information notes. newsletters and RE Information Center database.	RE Information center staff regularly, and are technically capable to, carry out abstracting of technical articles.
1.4. Conduct of Information Campaigns on RE Technology Applications in Outer Islands and Atolls (OIAs)	Printed information materials on RE technology promotion produced and disseminated quarterly starting yr2.	Disseminated RE technology information materials	This will be a regular and continuous activity of the NEO/MCST.
	Production of multi-media campaign materials on RE technology applications starting mid-yr1.	Documentation on the multi-media campaign materials preparation	This will also target the island resorts.
	Applicable RE technologies are demonstrated through one product exhibition at yr3 and four demonstration schemes during the duration of the project.	Documentation on the product exhibitions and the demonstration schemes.	Island resorts are also interested in implementing RE-based energy system projects on their own.
	An annual average of 100 RE-based energy projects is proposed by the IDCs and individuals starting yr3.	Documentation of the project proposals	Interest of IDCs in RE-based energy projects influenced by the information campaigns.
	An annual average of 20 replication projects are developed and implemented in country starting mid yr4.	Documentation of the replication projects	Regular monitoring of RE-based energy projects are carried out (see Activity 1.3)
1.5. Introduction of a "one-stop-shop" service for RE market services	RE "one-stop-shop" service is established in NEO to cater to the provision of RE market services by yr3.	RE "one-stop-shop" within the NEO providing RE market services.	
	RE "one-stop-shop" services provided to an average of about 40 clients each year starting yr3.	Documentation of services provided by the "one-stop-shop" and guest logbook.	
Component No. 2: RE Resource Assessment			
Outcome 2: Establishment of the availability and appropriate uses of RE resources in the country.	A comprehensive assessment and database of RE resources in the country completed by end of yr2 and utilized by the government and private sector for RE research, energy policy development and planning and RE project investments by end of project.	RE resource survey, assessment of technical requirements of RET applications, RE resource assessment methodology, RE resource database, RE monitoring and simulation methodology, and capacity building program for RE resource assessment	RE resource assessment activities in the country that are carried out by NREL and UNDP are included in the project.
2.1. Conduct of RE resource survey	RE resource (wind, solar, biomass, landfill gas, etc.) surveys in selected areas in the country where the RE resource potentials are significant completed by mid yr2.	Documentation of the surveys conducted and the survey results.	RE resource assessment activities in the country that are carried out by NREL and UNDP are included in the project.

Objectives and outcomes	Success indicators	Means of gauging success (verifiers)	Critical assumptions
	Comprehensive assessment results on the technical requirements wind/solar technology applications (e.g., wind velocities and solar radiation intensities) compiled and analyzed by end of yr2.	Documentation of the assessment conducted and the assessment results.	RE resource assessment activities in the country that are carried out by NREL and UNDP are included in the project.
	Comprehensive assessment results on the technical requirements of other relevant RE technology applications compiled and analyzed by end of yr2.	Documentation of the assessment conducted and the assessment results.	Other RE resource assessment activities to be covered by funding leveraged by NREL (e.g., USAID).
2.2. Development of a RE Resource Assessment Methodology	A suitable methodology for RE resource assessment agreed by Q2 of yr1.	First edition of the guidebook on the use of the methodology.	RE specialists in the country and in the region will participate in this activity.
	Methodology for RE resource assessment is used and improved each year.	Yearly updates of the methodology as printed in the guidebook.	This will be a regular and continuous activity of the MCST.
2.3. Design and development of a RE resource database	Comprehensive RE resource database covering selected island/atoll groups developed by end of yr2, and subsequently maintained by MCST.	Database installed at the RE Information Center in NEO/MCST.	Adequate and up-to-date database equipment are available.
	RE resource database is updated by MCST annually.	Yearly updates of the database	This will be a regular and continuous activity of the MCST. Inputs will come from results of RE resource assessments, which will continue after the RETDAP.
2.4. Development of a RE monitoring and simulation methodology	Suitable methodology for monitoring and simulation of wind energy resource completed by Q2 of yr3.	Guidebook on the wind energy resource monitoring and simulation methodology.	World-renowned RE Experts will contribute to this activity.
	Suitable methodology for monitoring and simulation of solar energy resource completed by Q2 of yr3.	Guidebook on the solar energy resource monitoring and simulation methodology.	
	Suitable methodology for monitoring and simulation of other relevant energy resources completed by Q3 of yr3.	Guidebook on the other RE resource monitoring and simulation methodology.	
	Results derived from RE monitoring and simulations are used in energy planning and policy making starting yr3.	Documentation of energy forecasts based on monitoring results and simulation runs	Energy planners are aware and knowledgeable in the use of the monitoring results and simulation runs in energy planning and policy making.
2.5. Conduct of capacity building program on RE resource assessment for relevant government agencies	In-house training for relevant government agencies (e.g., MCST, DMet) on RE resource data gathering, interpretations and analysis completed by yr1.	Satisfactory report on the in-house training and the documentation of the training course materials.	Relevant personnel are interested and willing in participating in the training and in applying the knowledge/know-how they learn.
	In-house training for relevant government agencies (e.g., MCST, DMet) on RE monitoring and simulation completed by end of yr3.	Satisfactory report on the in-house training and the documentation of the training course materials.	Relevant personnel are interested and willing in participating in the training and in applying the knowledge / knowhow they learn.

Objectives and outcomes	Success indicators	Means of gauging success (verifiers)	Critical assumptions
	About 30% of the trained personnel of RE resource assessments/monitoring and evaluation are providing training to other relevant MCST, DMet, OIA personnel each year starting yr3.	Documentation of training courses conducted and/or facilitated by personnel who have undergone training on RE resource assessments/monitoring and evaluation.	Training course is conducted regularly even after the RETDAP.
Component No. 3: RE Policy Development and Institutional Strengthening			
Outcome 3: Strengthening and improvement of the policy and regulatory framework to encourage feasible RE-based energy projects.	Government policy and accompanying implementing rules and regulations on the utilization of feasible RE resources for electricity and non-electricity projects is established by end of yr2.	National Energy Office (NEO), National energy policy incorporating RE development and utilization, RE promotion workshops, RE-based OIA electrification study, RE electricity pricing study, RE-based livelihood and productivity projects support policy study, energy balance in Maldives, integrated national energy planning, national energy policy implementation, and "one-stop shop" services.	The GoM will implement all activities relevant to RE development and geared towards the achievement of RE objectives.
3.1. Strengthening of the newly established national energy office (NEO) that will be responsible for all energy matters.	Adequately staffed with trained personnel in National Energy Office (NEO) by Q4 of yr2.	Fully functional NEO	All trained personnel for NEO staff positions will assume their job functions.
3.2. Formulation and implementation of a national energy policy incorporating RE development, utilization and pricing	A clear government policy on the promotion, development and utilization of RE both for electricity and non- electricity applications is established.	Documentation of the policy statement and supporting policies and regulations from the NEO.	
	Policy study concerning the provision of incentives (e.g., financial, fiscal) to prospective RE project developers completed by end of yr2.	Documentation of appropriate incentive policy recommendations.	
	Study on RE-based OIA electrification completed by end of yr2.	Documentation of the study	GoM policy will focus on bigger role of NRE in OIA electrification.
	RE-based OIA electrification policies including policy support activities and guidelines recommended to government by end of yr2.	Documentation of the proposed policies, policy support activities and implementation guidelines.	
	Study on RE electricity pricing completed by mid yr3.	Documentation of the study	
	Proposed policy and regulations on the production and sales of RE electricity recommended to, and considered by, the government by yr4.	Documentation of the proposed policies and implementing rules and regulations.	
	NEO personnel are doing energy policy formulation and review starting yr2.	Proposed energy policies formulated by NEO personnel.	

Objectives and outcomes	Success indicators	Means of gauging success (verifiers)	Critical assumptions
	NEO start formulation and recommendation of energy policies & framework starting mid-yr2.	Proposed energy policies formulated by NEO personnel.	
3.3. Conduct of RE promotion workshops focusing on the relevant policies, policy instruments and policy	National workshops on RE promotion and RE utilization for electricity and non-electricity applications conducted semi-annually until last year of project implementation.	Documentation of workshop proceedings	
	About 10 local groups in the OIAs propose policies and policy support activities on RE applications each year starting yr1.	Documentation of proposals of OIAs submitted to NEO.	
3.4. Conduct of a study on RE-based Livelihood and Productivity Projects Support Policy	Study of potential livelihood support and productivity projects that will utilize electricity from RE systems (stand-alone or hybrid) completed by yr1.	Documentation of the study	There are interested private entrepreneurs within the OIAs in investing livelihood and small/medium scale industrial activities.
	A total of 20 potential livelihood support and productivity projects are proposed and evaluated each year starting yr3.	Documentation of the proposals and applications for livelihood support and productive use projects/activities.	
3.5. Conduct of a detailed study on energy supply and consumption in Maldives	An initial detailed evaluation report on the energy supply and end-use consumption in Maldives, including energy demand and energy trends / profiles completed by yr2 and reviewed annually.	Evaluation report on national energy supply and end-use consumption	
	The national energy office (NEO) updates and reports on the energy balance of the country annually starting yr3.	Documentation of annual national energy balance.	
3.6. Conduct of an Integrated National Energy Planning	NEO personnel are capable of conducting least-cost integrated energy planning by yr2.	Energy planning reports prepared with significant contribution/inputs by NEO personnel.	
	Planners from relevant government agencies are capable of doing energy-integrated planning by yr2.	Energy planning reports prepared with significant contribution/inputs by NEO personnel.	
	The Initial National Energy Plan of Maldives is prepared and completed by yr2.	Documentation of the National Energy Plan	
3.7. Evaluation of the National Energy Policy Implementation	Annual growth of fossil based energy consumption is reduced by 2.2% by the end of the project.	Documentation of annual national energy balance.	
	Annual production of RE electricity is increased by 2.1% by end of project.	Documentation of the annual production and sales of RE electricity	
3.8. Conduct of a review of the RE Policy	Revised policy and implementing guidelines covering pricing, incentives, etc. issued and enforced by yr4.	Documentation of the revised policy and implementing guidelines	All RET demo projects are implemented, monitored and evaluated.

Objectives and outcomes	Success indicators	Means of gauging success (verifiers)	Critical assumptions
Component No. 4: RE Technical Capacity Building			
Immediate Objective 4a: Establishment of the potentials and requirements for the energy applications of RE resources, as well as the support provisions for such initiatives.	a. Assessment of the needs and potentials for applications of RE resources are completed and provisions for support are in place by end yr3.	Assessment of other value-added RE resource applications, study on a local RE consultancy service industry, assessment of local RE equipment and components manufacturing capabilities, training courses on the design, feasibility analysis, operation and maintenance of RE-based energy systems, sustainable RE system R&D program, and plans for RE-based power generation projects in OIAs. Capacity building for future RE manufacturing industry.	The NEO/MCST and local engineering firms are interested in developing the local RE engineering and consultancy industry, including the manufacturers, RE system equipment and components for domestic consumption or even for the export market.
Immediate Objective 4b: Continuous promotion and support of the development and application of RE resources for outer islands (electricity and non-electricity applications) supporting socio-development in OIAs.	a. The RE-based energy system owners, and private entrepreneurs in OIAs commit 10% of their gross revenues each year for supporting RE technology development starting yr 3. b. The GoM commits a percentage of its annual gross revenues for promotion and support of RE starting yr3.		
4.1. Assessment of Other Value-added Applications of RE Resources Assessment of the needs and potentials	Assessment of other value-added applications of RE resources completed by end of yr2.	Documentation of the various assessment conducted	Private sector and the IDCs are interested in other alternative uses of RE resources, either for energy or non-energy purposes.
	Recommendations on the development and implementation of other value-added applications of RE resources promoted & disseminated by end of yr2.	Assessment report	
4.2. Evaluation of the viability and the requirements for the development of a local RE Consultancy Service Industry	Assessment of the viability of a local RE consultancy service industry, completed by yr3.	Assessment report	
	A total of approx. 5 entities expressed interests and initiated plans to provide RE consultancy services by end of the project.	Documentation of investment proposals to relevant government agency	
4.3. Assessment of Local Capabilities for the Provision of RE Services	Evaluation report on the capabilities of local engineering and consulting services in the area of RE completed by mid yr4.	Evaluation report on local RE engineering and consultancy services	Cooperation of existing (if any) RE system maintenance service providers is ensured.
4.4. Assessment of the Viability of Local Manufacturing of RE System Equipment and/or Components	Assessment of the viability of local manufacturing of RE system equipment and/or components completed by end of yr3.	Evaluation report on local RE system and system component manufacturing	Private sector is interested in investing in the manufacturing of RE system equipment and/or components.
	Investors from within and outside the country used the study findings for possible investments in RE equipment manufacturing in the country by end of the project.	Documentation of investment proposals to relevant government agency.	

Objectives and outcomes	Success indicators	Means of gauging success (verifiers)	Critical assumptions
4.5. Design and conduct of Training Course on the Design, Feasibility Evaluation, Operation and Maintenance of RE Systems for potential local engineering consultants and RE system suppliers.	Comprehensive training course on the design, feasibility evaluation, maintenance and operation of RE systems for local engineering consultants completed by end of yr4.	Documentation of training course materials as well as the individual training course evaluation reports (highlighting results, trainee comments and recommendations) submitted to NEO/MCST	Training course designed for subsequent certification of local engineering companies and consultants by the NEO/MCST.
4.6. Design and initiation of a Sustainable RE System R&D Program	Sustainable RE system (wind, solar, biomass) R&D program designed by mid yr4.	Documentation of the proposed sustainable RE system R&D program	
	Sustainable RE system R&D program approved and initiated by the GoM by end of the project.	Documentation of the proposed R&D program	
4.7. Formulation of Plans for RE-based Power Generation Projects in OIAs.	Proposals for RE-based power system projects completed by end of project.	Documentation of project proposals at the NEO/MCST.	RE development is continuously and fully supported by the GoM for socio-economic development.
Component No. 5: RE Project Financing Schemes			
Immediate Objective 5: Encouragement of the government and private sectors to provide financial assistance to the development and implementation of RE-based energy projects, as well as livelihood and productive use initiatives that will utilize energy from RE-based projects.	Financing assistance program for RE-based energy projects, as well as RE-supported livelihood and productive use projects are established and availed of by project developers and island communities by end of yr3	Training on RE projects and RE-based livelihood/productivity projects financing, established FRESA in OIAs, FRESA financing schemes and eligibility criteria, assistance services for FRESA financing applicants, and evaluation report on FRESA project financing assistance program.	The GoM and the private sectors will be interested in investing in RE-based energy projects as well as livelihood support and productive use projects in the OIAs. Contingent upon the passing of the cooperative law in the Parliament.
5.1. Design and conduct of a Training Course on RE Projects and RE-based Livelihood / Productivity Projects Financing	A total of 3, one for each group, training courses conducted for: (1) private and government financial institutions; (2) commercial banks; and, (3) private entrepreneurs, by end Q2 of yr3.	Satisfactory report on the in-house training and the documentation of the training course materials.	GoM and the private sector will be interested in providing financing for rural livelihood and industry projects, including RE-based power generation.
	RE-based projects and productivity projects are being considered for financing by private and government financial institutions; commercial banks; and, private entrepreneurs starting yr4.	Documentation of processed / evaluated applications for financing support for RE-based energy and productive use projects.	
5.2. Design and establishment of a Fund for RE System Applications (FRESA) in OIAs	FRESA established by the GoM by mid -yr3.	Documentation of the official establishment of the FRESA	A financial institution is assigned as fund manager of the FRESA.

Objectives and outcomes	Success indicators	Means of gauging success (verifiers)	Critical assumptions
5.3. Design and development of FRESA Financing Schemes	Clear and well-defined mechanics of the FRESA financing scheme, including the financing eligibility criteria, available and enforced by mid yr3.	Documentation of the RE Fund including the financing mechanics, rules and regulations, eligibility criteria, etc.	
	Legal status of IDCs (if necessary) for availing of financing from FRESA is established and secured by the end of yr2.	Documentation of the legal status of IDCs for availing of FRESA financing.	IDCs are eligible to receive loans from FRESA and such is fully supported by the GoM.
5.4. Provision of Assistance Services to FRESA Financing Applicants	RE "One Stop Shop" in the NEO processing an average of 40 applications per year starting mid-yr3.	Documentation of the "One Stop Shop" service including the description of the services provided, procedures, recommendations, etc.	MCST will contribute to the operation of the "One Stop Shop".
Component No. 6: RE Project Development			
<p>Immediate Objective 6a: Demonstration of the techno-economic viability, design, development, financing and sustainable operation & maintenance of RE-based energy projects.</p> <p>Immediate Objective 6b: Facilitation of the effective demonstration of the techno-economic viability, design, development, financing and sustainable operation & maintenance of livelihood and productive use initiatives supported by RE-based energy projects.</p>	<p>a. Techno-economic feasibility of RE based energy projects in selected demo sites, including the necessary implementation requirements from the MCST, financing institutions and the national power utility established by yr3.</p> <p>b. Rural-based small to medium scale enterprises (SMEs) are operating profitably utilizing the energy from RE-based project by yr4.</p>	Techno-economic feasibility analyses of potential RE-based systems in OIAs, RET demo requirements evaluation, RE delivery mechanisms for demo schemes, activities for removing barriers to demo scheme implementations, baseline data for demo sites, FRESA implementation program, promotional campaigns for RE delivery mechanism demonstrations, design of RE system for demo sites, RE demonstration projects implementation, M&E of demonstration sites, revised RE policy, and published demonstration program results.	Co-financing is ensured for the implementation of identified demo RE projects, and that the private sector and/or the IDCs will be interested in operating and maintaining these facilities.
6.1. Conduct of Techno-economic Feasibility Analyses of Potential RE-based Systems in IAs	Report on the techno-economic feasibility analyses of potential RE-based energy systems in OIAs completed by yr3.	Techno-economic feasibility reports for each potential RE-based energy system projects.	
	An average total of 4 feasible RE-based energy systems in OIAs each year.	Project profiles of technically and economically feasible projects	
6.2. Finalization of the demo sites, identification and evaluation of RET Application Demo Requirements	Final list of demonstration sites approved by Q3 yr2.	Documentation of the final list of demonstration sites.	
	Report on the feasibility and implementation requirements for the demonstration schemes completed by end of yr2.	Documentation of the techno-economic feasibility of the specific demonstration projects.	

Objectives and outcomes	Success indicators	Means of gauging success (verifiers)	Critical assumptions
6.3. Identification and implementation (in conjunction with Item 6.2) of courses of actions for the removal of barriers to the successful implementation of RE technology application demonstration schemes.	Barriers to, and other necessary requirements for, the implementation of the demonstration schemes are eliminated / mitigated by the end of yr3.	Documentation of specific studies and actions taken to address the potential barriers to the implementation of the demonstration projects.	
	Verified and confirmed availability and magnitudes of RE resource potentials in the selected demonstration sites completed by the end of yr2.	Documentation of verified availability and magnitudes of RE resource at site that will be used for the RE technology demonstration	Review of techno-economic feasibility analyses will include verification of technical and physical characteristics of the demo sites.
	Financing assistance mechanism for financing of RE supported livelihood/productive use projects in the demo sites is set-up and implemented by Q1 yr3.	Documentation of the financial assistance arrangement with the selected financial institution (i.e., fund manager).	Fund manager is already assigned. And One-Stop shop is already operational.
6.4. Establishment of Baseline Data for the RE Technology Application Demonstration Sites	Electricity consumption and demand surveys at the demonstration sites and baseline performance data established by the Q2 yr2.	Electricity use and demand survey reports submitted to the NEO/MCST present electricity consumption of local residents as well as the expected demand of the planned livelihood support and productive use projects that will be set up in the area.	
	Operating performance targets for the planned RE systems are defined by Q2 yr2.	Documentation of agreed performance targets and the procedures for monitoring and evaluating the actual operating performance.	
6.5. Finalization of the design of the RE system that will be implemented in the demonstration schemes.	RE system basic engineering design for each demo site completed by Q3 yr2.	Documentations of the approved basic engineering designs.	
	Comprehensive technical and economic feasibility evaluations of demo RE systems completed by end of yr2.	Documentations of the completed and reviewed technical and economic feasibility reports.	
	Detailed engineering designs of each demo RE systems completed and approved by Q2 of yr3.	Documentations of the approved detailed engineering designs and equipment specifications.	
6.6. Implementation of RE demonstration projects	Equipment procurement and delivery at each site completed well within project time line.	Documentations of the equipment supply proposals, approved bids, procurement, shipment, delivery and acceptance, and physical equipment at demo sites.	To be implemented by the NEO/MCST (if no private sector involvement) or by the private developer (i.e., its own engineering staff or hired consultants contractors).
	Civil engineering, electro-mechanical equipment and support facilities construction completed well within project time line.	Documentations of the civil engineering, electro-mechanical designs and support facilities. Actual inspection and inspection report of erected facilities.	
	Installation and commissioning of each demo RE system completed well within project time line.	Actual inspection and inspection reports, as well as the commissioning reports.	

Objectives and outcomes	Success indicators	Means of gauging success (verifiers)	Critical assumptions
	Demo site owners are satisfied with the technical assistance provided during start-up of the facilities.	Documentation of technical services provided during start-up and initial operations of facilities.	RETDAP consultants provide technical assistance in the design, engineering, and installation/commissioning of demos.
6.7. Monitoring and Evaluation of the performance of each demonstration scheme	An evaluation report for each demo RE system highlighting the operating and economic performances completed midway of project implementation.	Documentation of each technical and economic performance evaluation report	
	RE-based energy system project implementers are reporting bi-annually the energy and GHG reduction impacts of their respective projects.	Bi-annual reports submitted by RE based energy system project implementers submitted to NEO/MCST.	
	Survey of energy savings from RE-based system (non-electricity) projects conducted annually starting yr4.	Survey reports including the survey evaluation report.	
6.8. Evaluation and dissemination of the results of the Demonstration Program	A national workshop presenting the results of the demonstration program	Proceedings of the workshop highlighting the papers presented, issues discussed, and recommendations.	
	Documented comments about the operation of the demonstration program by end of project.	Documentation of each technical and economic performance evaluation report submitted to NEO/MCST.	
	Increased installed capacity of RE-based power systems in the country bringing up the total to 100 kW by end of project.	Documentation of installed RE-based power systems in the country at NEO/MCST	
6.9. Design of sustainable follow-up program for RE development	Financing scheme is in place for supporting a follow up program for RE technology applications by end of yr4.	Documentation of the proposed financing scheme for the follow up program on RE technology applications.	Sufficient RE resources exist for large scale development of RE energy applications.



ANNEX III. WORK PLAN AND BUDGET BREAKDOWN

Schedule of activities

Activities	Year 1				Year 2				Year 3				Year 4			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1. RE Advocacy and Awareness Enhancement																
1.1. Establishment of a RE Information Center in MCST																
1.2. Design and conduct of a RE Technology Education Program																
In-house RE technology training course for MCST staff																
Study tour/fellowship program on RE system design and applications																
Comprehensive training course on RE technology, maintenance and operation																
1.3. Establishment and implementation of a RE Information Exchange Service																
Operation of information exchange services program																
Publication and circulation of a newsletter																
Preparation of profiles of monitored RE-based energy projects or installations																
Preparation of Abstracts/Information notes on RE Technology																
1.4. Conduct of Information Campaigns on RE Technology Applications in OIAs																
Production and dissemination of printed information materials on RE technology																
Production of multi-media campaign materials on RE technology applications																
RE systems and products exhibition																
1.5. Introduction/operation of a "one-stop-shop service" for RE market development																
2. RE Resource Assessment																
2.1. Development of a RE Resource Assessment Methodology																
2.2. Conduct of RE resource survey																
Detailed assessments of technical requirements of wind/solar applications.																
Detailed assessments of technical requirements of other RE applications.																
2.3. Design and development of a RE resource database																
Comprehensive RE resource database development & maintenance																
2.4. Development of a RE monitoring and simulation methodology																
Development of methodology for M&E and simulation of wind energy resource																
Development of methodology for M&E and simulation of solar energy resource																
Development of methodology for M&E and simulation of other RE resources																
2.5. Conduct of capacity building program on RE resource assessment																
In-house training on RE resource data gathering, interpretations and analysis																
In-house training on RE monitoring and simulation																
3. RE Policy Development And Institutional Strengthening																
3.1. Strengthening of the newly established national energy office (NEO)																
3.2. Formulation of a national energy policy incl. RE development, use and pricing																
Policy study on incentives (e.g., financial, fiscal) to RE project developers																
Study on RE-based OIA electrification																
Study on RE electricity pricing																
Conduct of energy policy formulation and review by NEO personnel																
Formulation and recommendation of energy policy statements and framework																
3.3. Conduct of RE promotion workshops focusing on the relevant policies, policy instruments and policy support activities																
3.4. Conduct of study on RE-based Livelihood & Productivity Project Support Policy																
3.5. Conduct of a detailed study on energy supply and consumption in Maldives																
3.6. Conduct of an Integrated National Energy Planning																
Capacity building on least-cost integrated energy planning																
Preparation of the National Energy Plan of Maldives																
3.7. Evaluation of the National Energy Policy Implementation																
3.8. Conduct of a review of the RE Policy																

4. RE Technical Capacity Building												
4.1. Assessment of Other Value-added Applications of RE Resources												
4.2. Evaluation of the viability and the requirements for the development of a local RE Consultancy Service Industry												
4.3. Assessment of Capabilities of Existing Engineering and Consulting Firms in the Provision of RE Services												
4.4. Assessment of the Viability of Local Manufacturing of RE System Equipment and/or Components												
4.5. Design and conduct of Training Course on RE Systems for potential local engineering consultants and RE system equipment suppliers.												
4.6. Design and initiation of a Sustainable RE System R&D Program												
4.7. Formulation of Plans for RE-based Power Generation Projects in OIAs.												

5. RE Project Financing Schemes												
5.1 Design/Conduct training on RE projects and Livelihood/ Productivity Financing												
5.2. Design and establishment of a Fund for RE System Applications (FRESA)												
5.3. Design and development of FRESA Financing Schemes												
5.4. Provision of Assistance Services to FRESA Financing Applicants												
5.5. Evaluation of the FRESA Project Financing Assistance Program												

6. RE System Project Development												
6.1. Conduct of Techno-economic Feasibility Analyses of RE systems in OIAs												
6.2. Identification and evaluation of RET Application Demonstration Requirements												
6.3. Identification and removal of barriers to the successful implementation of RE technology application demonstration schemes.												
6.4. Establishment of Baseline Data for the RET Application Demonstration Sites												
6.5. Finalization of the selection of demonstration sites, and design of RE system												
Approval of final list of demonstration sites												
Conduct of RE system basic engineering design for each demo site												
Conduct of comprehensive technical and economic feasibility evaluations												
Conduct of detailed engineering designs of each demo RE systems												
6.6. Implementation of RE demonstration projects												
Procurement and delivery of equipment at each site												
Civil engineering & design of electro-mechanical equipment and support facilities												
Installation and commissioning of each demo RE system												
6.7. Monitoring and Evaluation of the performance of each demonstration scheme												
6.8. Evaluation and dissemination of the results of the Demonstration Program												
6.9. Design of sustainable follow-up program for RE development												
 = Project implementation activity  = Follow up activity												

Note: Baseline activities (funded by UNDP TTF or UNOPS/Nordic Fund) have started in Year 1 (2003-2004), while GEF-supported activities cover Year 2 (2004-2005), Year 3 (2005-2006) and Year 4 (2006-2007).

Detailed budget breakdown and co-financing contributions

The following tables show the breakdown of the project budget, by type of input (budget line), group of activities (component) and sources of funding.

BUDGET LINE	TOTAL [USD]	GEF	BASELINE	BASELINE								
				IN-KIND	CASH	CASH						
						GOM	TRAC	UNDP-TTF	UNOPS	MAA	STELCO	GFF
PDF:	25,000	25,000	0	0	0							
Personnel:	400,730	165,800	234,930	195,130	39,800		35,000	4,800				
Subcontracts:	283,660	11,210	272,450	0	272,450				175,000		97,450	
Training, Workshops, Meetings:	123,370	61,820	61,550	7,500	54,050	6,050	7,500	40,500				
Equipment:	1,294,170	33,620	1,260,550	88,550	1,172,000	13,950	50,000	41,500			1,062,550	4,000
Micro-Finance Fund	355,000	225,000	130,000	0	130,000					130,000		
Travel	199,600	176,800	22,800	12,500	10,300		7,500	2,800				
Evaluation mission(s):	21,750	21,750	0	0	0							
Miscellaneous:	60,500	29,000	31,500	27,100	4,400			4,400				
Project total (PDF + project costs):	2,763,780	750,000	2,013,780	330,780	1,683,000	20,000	100,000	94,000	175,000	130,000	1,160,000	4,000

COMPONENT	TOTAL [USD]	GEF	BASELINE	BASELINE								
				IN-KIND	CASH	CASH						
						GOM	TRAC	UNDP-TTF	UNOPS	MAA	STELCO	GFF
1: RE Advocacy & Awareness	194,460	85,560	108,900	78,900	30,000	20,000		10,000				
2: RE Resource Assessment	250,440	20,360	230,080	31,080	199,000			84,000	115,000			
3: RE Policy Devpt & Instit. Strengthening	162,160	58,580	103,580	43,580	60,000				60,000			
4: RE Technical Capacity Building	140,220	121,650	18,570	18,570	0							
5: RE Project Financing Schemes	466,740	256,810	209,930	29,930	180,000		50,000			130,000		
6: RE System Project Development	1,524,760	182,040	1,342,720	128,720	1,214,000		50,000				1,160,000	4,000
Sub-Total	2,738,780	725,000	2,013,780	330,780	1,683,000	20,000	100,000	94,000	175,000	130,000	1,160,000	4,000
PDF-A Funds	25,000	25,000	0	0	0							
Total	2,763,780	750,000	2,013,780	330,780	1,683,000	20,000	100,000	94,000	175,000	130,000	1,160,000	4,000

Budget assumptions:

Category	Budget line	Rate [USD]	Unit
International consultant	11	500	day
CTA/project coordinator	17	1200	month
International travel	16	4000	ticket
Male' DSA		100	day
National consultant	17	935	month
Training/seminar	32	390	day
Workshop		500	day
Travel for training		8000	course
Fee for/cost of training		5000	
Travel for study tour/fellowship		20000	
Cost of fellowship/study tour		12000	

Activity	TTF	UNOPS	Local cash (GoM, MAA, Stelco, GFF)	TRAC	GEF	TOTAL COST	In-kind	GRAND TOTAL
1. RE Advocacy and Awareness	10,000	0	20,000	0	85,560	115,560	78,900	194,460
1.1 Establishment of RE Info Center in MCST					15,888	15,888		
1.2 Design and conduct of RE Technology Education program	2,500				38,268	40,768		
1.3 Establishment and implementation of integrated RE Info Exchange service			13,950		12,268	26,218		
1.4 Conduct of Info Campaigns on RE tech Applications	7,500		6,050		19,138	32,688		
1.5 Introduction of 'one-stop-shop' services						0		
2. RE Resource Assessment	84,000	115,000	0	0	20,360	219,360	31,080	250,440
2.1 Conduct of RE resource survey	45,900	85,000				130,900		
2.2 Development of a RE resource assessment methodology	900	15,000				15,900		
2.3 Design and development of a RE resource database	3,200	15,000				18,200		
2.4 Development of a RE monitoring and simulation methodology					20,360	20,360		
2.5 Capacity building on RE resource assessment (for government agencies)	34,000					34,000		
3. RE Policy Development and Institutional Strengthening	0	60,000	0	0	58,580	118,580	43,580	162,160
3.1 Strengthening of the Natl Energy Office(NEO) (eg. Policies, rules, regulations)					8,516	8,516		
3.2 Formulation and implementation of a Natl Energy policy						0		
3.3 Conduct RE Promotion workshop and training (focusing on policies issues and activities)		5,000				5,000		
3.4 Study on RE based Livelihood and productivity projects support policy					8,516	8,516		
3.5 Conduct of detailed study on energy supply & consumption in Maldives		46,000			8,516	54,516		
3.6 Integrated National Energy Planning		9,000			8,516	17,516		
3.7 Evaluation of Natl Energy Policy Implementation and workshops					24,516	24,516		
3.8 Conduct of RE policy review						0		
4. RE Technical Capacity Building	0	0	0	0	121,650	121,650	18,570	140,220
4.1 Assessment of Other Value Added Applications of RE resources					8,814	8,814		
4.2 Evaluate the development of a local RE consultancy service industry					8,814	8,814		
4.3. Assessment of existing engineering & consulting firms in the provision of RE Services					8,814	8,814		
4.4 Assessment of local manufacturing of RE system equipment and/or components					8,814	8,814		
4.5 Training courses on RE systems (for engineers and equipment suppliers)					68,764	68,764		
4.6 Design and initiation of a sustainable RE system R&D program					8,814	8,814		
4.7 Form plans for RE based power generation projects in OIAs					8,814	8,814		
5. RE Project Financing Schemes	0	0	130,000	50,000	256,810	436,810	29,930	466,740
5.1 Training course on RE projects and RE based Livelihood/ Productivity Financing					19,270	19,270		
5.2 Design/ establish a Fund for RE System Applications (FRESA) in OIAs			130,000		231,270	361,270		
5.3 Design/develop of FRESA Financing Schemes; establish eligibility criteria				50,000	6,270	56,270		
5.4 Provide Assistance Service to FRESA Financing Applicants						0		
5.5 Evaluation of FRESA Project Financing Assistance Program						0		
6. RE System Project Development	0	0	1,164,000	50,000	182,040	1,396,040	128,720	1,524,760
6.1 Techno-Economic Feasibility Analyses of Potential RE Based Systems in OIAs					13,870	13,870		
6.2 Identify and assess RE Technology Application Demo project requirements					13,870	13,870		
6.3 Identify appropriate barrier removal and RE delivery mechanism (for each potential sites)					50,740	50,740		
6.4 Establish Baseline data for RE tech application demo sites					23,870	23,870		
6.5 Technical design of RET system (in each demonstration site)			97,450		13,870	111,320		
6.6 Implement RE demo projects			1,066,550	50,000	13,870	1,130,420		
6.7 Monitor/evaluate the performance of each demo scheme					37,740	37,740		
6.8 Evaluate and disseminate results of Demo program					14,210	14,210		
6.9 Design of sustainable follow-up program for RE development						0		
GEF PDF-A					25,000	25,000		25,000
TOTAL	94,000	175,000	1,314,000	100,000	750,000	2,433,000	330,780	2,763,780

ANNEX IV. TERMS OF REFERENCE FOR CONSULTANTS AND SUBCONTRACTS

1. National project coordinator / Chief Technical Advisor

Duration: 3 years (36 work-months)

Location: Male'

Remuneration: As nationally recruited consultant, commensurate with qualifications, skills and experience

Description:

- Work closely together with national project director (NPD) in advocating general sustainable energy issues at the ministry level;
- Work closely together with UNDP country office in project guidance and implementation;
- Work closely together with NPD and project steering committee (PSC) in advising on the policy direction of conduct of activities of RETDAP during its implementation;
- Serve as secretary to PSC, preparation of status reports for the PSC and maintain minutes of meeting;
- Day-to-day management and coordination, monitoring and evaluation of the project activities
- Liaise with project participants and stakeholders, including national organizations and NGOs
- Lead the detailed work planning of actual implementation of the project activities, including:
 - Budgeting and preparation of financial reports
 - Finalising the terms of reference for consultants and subcontract
 - Providing overall guidance to international and national consultants and subcontractor, including contract management, supervision of field operations, logistical support and review of deliverables/reports
 - Planning and coordinating the various workshops and course identified in the project document;
- Assist, in close coordination with the NPD, in the design and supervision of all the baseline activities mentioned in the project document, in particular, provide technical assistance to STELCO and MCST on the design of and institutional delivery modes and technical specifications for the selected demonstration projects, as well as on the development of the Fund for RE System Applications (FRESA);
- Assist in the development of strategies and business plans for the National Energy Office (NEO) and RE Information Centre
- Undertake other management duties that contribute to the effective functioning of the project
- Take a lead role in the organisation of a kick-off workshop as well as a national workshop of evaluation and dissemination of results of the demonstration programme (activity 6.8)

Qualifications:

- Post-graduate training in economics or business administration (with a strong energy component), engineering (with a strong energy component and economics background)
- Extensive knowledge of energy sector in Maldives and development issues and institutions in Maldives
- Familiarity with energy issues and options for sustainable development
- At least 5 years working experience in business or project management
- Excellent English reading, speaking and writing skills;
- Very good knowledge of Dhivehi

Deliverables:

- Work plan and budget for RETDAP, detailed per activity and type of input
- Finalised terms of reference for consultants and subcontractor
- Progress and evaluation reports; financial reports
- Minutes of PSC meetings
- Agenda and materials for national workshops

2. National consultant on Information and awareness

Duration: 47 work-days

Location: Male', with internal travel in Maldives

Remuneration: Commensurate with qualifications, skills and experience

Description:

- Work under the guidance of the Chief Technical Advisor (CTA), National Project Director (NPD) and in close cooperation with the International Consultant on Information, Training and Awareness
- Provide advice on the organisation and tasks of the RE Information Exchange Centre (REIEC) to be established within the National Energy Office (NEO) of MCST (activity 1.1)
 - Create a website at NEO-REIEC and link with related websites in other key agencies in Maldives as well as establish operational links with other RE centres in the world
 - Assist in setting up a library with documentation about sustainable energy and international journals
 - Compile and information database on sustainable energy resources potential, equipment suppliers, project profiles as well as policy and regulations relevant to sustainable energy
 - Collect and disseminate the of successful RE models and projects in other countries through workshops and website
- Assist the International Consultants in the organisation of a training courses on RE technology and project development (government, non-government OIA development personnel)
- Provide advice on training courses on RE system operation and maintenance other training (in close cooperation with the International Consultants; activities 1.2 and 4.5)
- Play a leading role in the organisation and implementation of information campaigns in Male' and Outer Islands (OIAs; activity 1.4)
 - Elaboration and dissemination of printed materials and multi-media materials
 - Organisation of RE product exhibition fair
 - Organisation of programme of workshops (with other consultants)
- Participate in national workshop of evaluation and dissemination of results of the demonstration programme (activity 6.8)

Qualifications:

- Relevant training in information management or education or public policy or library sciences
- Extensive experience in documentation and information management
- Strong linkage with agencies, private sector, OIA development agencies in Maldives and good networking skills
- Familiarity with sustainable energy issues would be an asset
- Excellent computer skills
- Excellent English reading, speaking and writing skills;
- Native Dhivehi speaker

Deliverables:

- Website for REIEC
- Documentation (publications, journals, abstracts, etc.) and information database, established at REIEC
- Published newsletters and articles
- Training course materials prepared and collected for the various workshops; list of potential workshop participants and workshop agendas
- Multi-media materials and RE information materials
- RE product demonstration

3. National consultant on Energy Demand and Policy

Duration: 82 work-days

Location: Male', with internal travel in Maldives

Remuneration: Commensurate with qualifications, skills and experience

Description:

- Work under the guidance of the Chief Technical Advisor (CTA), National Project Director (NPD) and in close cooperation with the International Consultant on Sustainable Energy Policy
- Assist in the organisation of the RE Technology and other relevant RE workshops of RETDAP (activities 1.2, 4.5 and 5.1)
- On an as-needed basis, organise a follow-up survey of energy supply and consumption in potential demonstration and other sites (based on the baseline work done by TTF/UNOPS-funded consultants; activities 3.5 and 6.4), including survey design, supervision and analysis and reporting
- Advise on RE-based livelihood and productivity projects (activity 3.4)
- Assist in the development of RE demand and supply analysis and initial energy balance of the country (using the data obtained from the above-mentioned study and UNOPS/TTF-funded activities as inputs) and organise in-house training on energy modelling and analysis (activities 2.4 and 3.5)
- Provide recommendations and results of the above-mentioned studies to MCST and Government, as input to the first National Energy Plan of Maldives (based on baseline work done by TTF/UNOPS consultants and in cooperation with Consultant on RE Financing); present results in seminars and workshops (activities 3.3, 3.6 and 3.7),
- Assist in formulation of plans for post-RETDAP RE-based project development (with Consultants on RE systems) as well as capacity building (design and initiation of sustainable R&D programme; activities 4.6 and 4.7)
- Participate in national workshop of evaluation and dissemination of results of the demonstration programme (activity 6.8)

Qualifications:

- Relevant training in social sciences, economics or statistics
- Proven experience in organising surveys (experience in energy surveys would be an asset), i.e., ability to draft questionnaires, implement consumer research surveys, compile results and analyse data
- Strong linkage with agencies, private sector and development agencies in Maldives and good networking skills
- Good knowledge of statistical analysis and experience with relevant software packages
- Familiarity with energy issues
- Excellent computer skills
- Excellent English reading, speaking and writing skills;
- Native Dhivehi speaker

Deliverables:

- Training course materials for RE policy workshops and other RETDAP workshops
- Agenda and materials for in-house training on energy modelling and data analysis and advisory services
- Information and data collected as needed for energy demand and supply balance, including survey data and reports

4. International consultant(s) on RE systems and Technical Capacity Building

This contains the outline of the TORs for consultants on RE systems. Consultants may be contracted according to type of technology (hybrid systems, solar thermal and biogas) as the expertise needed is usually technology-specific. The TORs will be further developed during the project by the CTA, specifying the type of technology.

Duration: 122 work-days

Location: Male', with internal travel in Maldives

Remuneration: Commensurate with qualifications, skills and experience

Description:

- Work under the guidance of the Chief Technical Advisor (CTA), National Project Director (NPD) and in close cooperation with the National Consultant on RE systems
- Assessment of local capability to provide (activities 4.2, 4.3 and 4.4)
 - Local manufacturing RET equipment or components (workshops, industrial)
 - Technical and maintenance services for the RE technology (workshops, industrial)
 - Consultancy and project engineering services
- Design and conduct training courses on RE system design, operation and maintenance and feasibility analysis other training (in cooperation with the Consultants on Energy Policy; activities 1.2 and 4.5)
- Support techno-economic feasibility analyses of RET application projects in Maldives (activity 6.1)
- Preparatory advice on the RET application demonstration project (activities, 6.2, 6.3, 6.4)
 - Selection of demonstration site(s), taking into account magnitude and availability of resources at the site(s) and implementation requirements (e.g., logistical, financial, manpower, technical, etc.)
 - Suggest courses of action to successfully implement projects (administration, operation and maintenance, guidelines and procedures, permits, on-the-job training of operators)
 - Establish baseline and operating performance targets
- Design of RET system project in the demonstration site (activity 6.5):
 - Basic engineering design, including realistic costing of RE equipment
 - Techno-economic feasibility analysis and financial set-up (with Consultant on Financing)
- Provide assistance, as requested, in the implementation of the RET demonstration project, such as the preparation of tender documents and tender evaluation (activity 6.6)
- Advice on design and initiation of sustainable R&D programme (activity 4.6) and plans for RE-based project development beyond RETDAP (activity 4.7)
- Participate in national workshop of evaluation and dissemination of results of the demonstration programme (activity 6.8)

Qualifications:

- Degree in engineering
- At least 9 years experience in sustainable energy and in-depth technical knowledge of RE technology concerned
- Proven experience in technical design and implementation of energy projects in developing countries (experience in small island states would be an recommendable)
- Excellent English reading, speaking and writing skills

Deliverables:

- Training materials and general and technical information on RE technology disseminated
- Report on RET support infrastructure in Maldives (local manufacturing, technical and maintenance services, consultancy and engineering services, R&D)
- Technical report on RET demonstration project design, including site selection, organisational set-up, including engineering design, costing, feasibility analysis), including tender documents (including hardware specifications)

5. National consultant on RE systems

Duration: 200 work-days

Location: Male', with internal travel in Maldives

Remuneration: Commensurate with qualifications, skills and experience

Description:

- Work under the guidance of the Chief Technical Advisor (CTA), National Project Director (NPD) and in close cooperation with the International Consultant(s) on RE systems and Technical Capacity Building
- Assist in the assessment of local capability to provide (activities 4.2, 4.3 and 4.4)
 - Local manufacturing RET equipment or components (workshops, industrial)
 - Technical and maintenance services for the RE technology (workshops, industrial)
 - Consultancy and project engineering services
- Take a key role in designing and conducting training courses on the design, feasibility analysis and operation and maintenance of RE systems (activity 4.5; with Consultants on Sustainable Energy Policy)
- Assist in techno-economic feasibility analyses of RET application projects in Maldives (activity 6.1)
- Play a strong advisory role in the preparation of RET demonstration projects (activities, 6.2, 6.3, 6.4)
 - Selection of demonstration site(s), taking into account magnitude and availability of resources at the site(s) and implementation requirements (e.g., logistical, financial, manpower, technical, etc.)
 - Suggest courses of action to successfully implement projects (administration, operation and maintenance, guidelines and procedures)
 - Establish baseline and operating performance targets
- Advice on the design of RET system project in the demonstration site (activity 6.5), including basic engineering design and techno-economic feasibility analysis
- Provide assistance in the implementation of the RET demonstration project (activity 6.6):
 - Preparing of tender documents and tender evaluation
 - Technical assistance during engineering design, equipment procurement, construction of civil works and support facilities, installation and commissioning
 - Organisation (administration, operation and maintenance systems)
- Advice on design and initiation of sustainable R&D programme (activity 4.7)
- Participate in national workshop of evaluation and dissemination of results of the demonstration programme (activity 6.8)

Qualifications:

- Relevant education background in mechanical and/or electrical engineering
- Proven experience in electrification and/or other energy-related project in Maldives
- Experience in project management would be an asset
- Strong linkage with agencies, private sector and OIA development agencies and good networking skills
- Familiarity with electrical and/or non-electrical renewable energy technology
- Excellent English reading, speaking and writing skills
- Native Dhivehi speaker

Deliverables:

- Agenda and materials for technical training course(s) on RE systems
- Reports on RET support infrastructure in Maldives (local manufacturing, technical and maintenance services, consultancy and engineering services, R&D)
- Report on RET demonstration project design, including site selection, organisational set-up, including engineering design, costing, feasibility analysis)

6. International consultant on RE Project Financing Mechanisms

<u>Duration:</u>	26 work-days
<u>Location:</u>	Male', with internal travel in Maldives
<u>Remuneration:</u>	Commensurate with qualifications, skills and experience

Description:

- Work under the guidance of the Chief Technical Advisor (CTA), National Project Director (NPD) and in close cooperation with the National Consultant on Financing and Small Credit
- Participate and present financial issues and options in training courses and workshops on RE Technology (for technical and non-technical personnel (activity 1.2, 4.5 and/or 6.3)
- Design and conduct training course(s) for financial institutions, commercial banks and private entrepreneurs on RE projects and RE-based livelihood/productivity projects financing (activity 5.1)
- Take a lead advisory role in the Fund for RE System Applications (FRESA) as a special window under the existing Ministry of Atolls Administration's (MAA) credit facility (activities 5.2 and 5.3):
 - Fund management arrangements and modalities of the FRESA window
 - Design appropriate financing schemes (loan terms, loan repayment period, eligibility criteria, risk guarantees)
- Assist in the design and implementation of the RET demonstration projects site by proposing the project financing package, including possible finance from the FRESA fund, and project financial feasibility analysis (activities 6.5 and 6.6)
- Work with Consultants on Energy Policy and on RE systems in the formulation of bankable RE projects for the post-RETdap period and advice on the possible financial sources (e.g., bilateral and multilateral concessional financing, internal investment, commercial financing (activity 4.7)
- Participate in national workshop of evaluation and dissemination of results of the demonstration programme (activity 6.8)

Qualifications:

- Post-graduate degree in economics or business economics or financing/banking
- At least 10 years experience in financing, of which 5 years in micro-credit schemes in developing countries
- Familiarity with financing issues in Maldives would be an asset
- Proven experience in preparing for financial arrangements and financial project evaluation
- Knowledge and familiarity with international assistance projects, multilateral and commercial financial institutions
- Excellent English reading, speaking and writing skills

Deliverables:

- Training course materials for workshops on financing RE-based projects on for other relevant workshops
- Report on the organisational set-up of FRESA and its financing schemes and modalities, including proposed funding arrangement for the demonstration projects and recommendations for the required legal-regulatory framework on micro-credit and finance for RET applications

7. National consultant on Financing and Small Credit

Duration: 47 work-days

Location: Male', with internal travel in Maldives

Remuneration: Commensurate with qualifications, skills and experience

Description:

- Work under the guidance of the Chief Technical Advisor (CTA), National Project Director (NPD) and in close cooperation with the International Consultant on RE Project Financing Mechanisms
- Participate and present financial issues and options in training courses and workshops on RE Technology (for technical and non-technical personnel (activity 1.2, 4.5 and/or 6.3)
- Assist in the design and conduct training course(s) for financial institutions, commercial banks and private entrepreneurs on RE projects and RE-based livelihood/productivity projects financing (activity 5.1)
- Take a key role in the design and implementation of the Fund for RE System Applications (FRESA) as a special window under the existing Ministry of Atolls Administration's (MAA) credit facility (activities 5.2 and 5.3):
 - Analysis of the functioning of existing micro-credit schemes and proposed new regulatory framework
 - Fund management arrangements and modalities of the FRESA window
 - Evaluate possible financing schemes (loan terms, loan repayment period, eligibility criteria) and make recommendations on selection of appropriate scheme(s)
- Assist in the design and implementation of the RET demonstration projects site by proposing the financial set-up, including possible finance from the FRESA fund, and financial feasibility analysis (activities 6.5 and 6.6)
- Participate in national workshop of evaluation and dissemination of results of the demonstration programme (activity 6.8)

Qualifications:

- Relevant education background in finance, economics or business economics
- Should have 5 years experience in project finance and micro-credit in Maldives
- Experience in management of private or government financial institutions or projects would be an asset
- Strong linkage with agencies, private sector, financial institutions and OIA development agencies and good networking skills
- Familiarity with energy issues would be a valuable asset
- Excellent English reading, speaking and writing skills
- Native Dhivehi speaker

Deliverables:

- Training course materials for workshops on financing RE-based projects on for other relevant workshops
- Report on the organisational set-up of FRESA and its financing schemes and modalities, including proposed funding arrangement for the demonstration projects and recommendations for the required legal-regulatory framework on micro-credit and finance for RET applications

8. International consultant on Sustainable Energy Policy

<u>Duration:</u>	65 work-days
<u>Location:</u>	Male', with internal travel in Maldives
<u>Remuneration:</u>	Commensurate with qualifications, skills and experience

Description:

- Work under the guidance of the Chief Technical Advisor (CTA), National Project Director (NPD) and in close cooperation with the National Consultant on Energy Demand and Policy
- Work with MCST and CTA to strengthen the role and tasks of the newly established NEO and assist CTA in overall guidance of the project (activity 3.1)
- Provide advice on the organisation and tasks of the RE Information Exchange Centre (REIEC) and to be established within the National Energy Office (NEO) of MCST (activity 1.1)
 - Development of business plan and schedule of activities of the REIEC
 - Outline and possible contents of quarterly newsletter on sustainable energy and related issues
 - Advice on subscription to international journals, newsletter and documentation on sustainable energy
 - Advice on the creation of a website at NEO-REIEC and link with related websites in other key agencies in Maldives as well as establish operational links with other RE centres in the world
- Conduct policy advocacy to coordinate policy dialogue between government, utility, private sector and NGOs, by
 - Assisting in other relevant RE workshops of RETDAP, focussing on policy and policy instruments (activities 4.5 and 5.1)
 - Advising on the organisation of a study tour/fellowship programme on RE systems and policy for selected government and private sector personnel (with Consultants on RE Systems and Energy Policy, activity 1.2)
- Analyse data on energy supply and consumption in various sectors of the country (including data from the UNOPS-funded surveys on energy demand and supply; activities 3.5, 4.1 and 6.4)
- Assist in the development of RE demand and supply analysis and initial energy balance of the country (using the data obtained from the above-mentioned study and UNOPS/TTF-funded activities as inputs) by using an appropriate computerised simulation programmes, such as LEAP, and advice on in-house training on energy modelling and analysis (activities 2.4 and 3.5)
- Provide technical and managerial advice on the organisation of information campaigns in Male' and Outer Islands (OIA's; activity 1.4)
- Conduct a study on RE-based value-added applications of RE resources, carry out techno-economic feasibility analysis of potential RE-based energy systems (activities 3.4 and 6.1) and assist in feasibility analysis of demo projects (activity 6.5)
- Provide advice on training courses on RE system operation and maintenance other training and suggest courses of action to successfully implement projects (administration, operation and maintenance, guidelines and procedures, permits, on-the-job training of operators, local participation; in close cooperation with the Consultants on RE Systems and Technical Capacity Building; activities 1.2, 4.5 and 6.3)
- Provide recommendations and results of the above-mentioned studies to MCST and Government, as input to the first National Energy Plan of Maldives (based on baseline work done by TTF/UNOPS consultants and in cooperation with Consultant on RE Financing); present results in seminars and workshops (activities 3.3, 3.6 and 3.7),
- Assist in formulation of plans for post-RETDAP RE-based project development (with Consultants on RE systems) as well as capacity building (design and initiation of sustainable R&D programme; activities 4.6 and 4.7)
- Participate in national workshop of evaluation and dissemination of results of the demonstration programme (activity 6.8)

Qualifications:

- Post-graduate degree in engineering or social sciences
- At least 10 years experience in sustainable energy, of which 5 years in developing countries

- Must be familiar with issues of RE development in Maldives
- Proven experience with organisation of energy studies, energy modelling and policy analysis
- Demonstrable experience in RE project development
- Extensive knowledge of renewable energy and energy efficiency issues and options
- Excellent English reading, speaking and writing skills

Deliverables:

- Training course materials on policy analysis and policy instruments for selected workshops
- General information materials on RE technology, project experiences, policy instruments and financial incentives
- Report on energy balance for Maldives
- Report on opportunities for application of RE in Maldives (including RE-based productivity projects), including feasibility and impact analysis, and recommendations on enabling environment for such RE activities, in terms of policy and regulatory framework, pricing, financial incentives and capacity building measures
- Business plan for REIEC
- Work plan for study tour/fellowship programme of RETDAP

9. Subcontract on monitoring and evaluation of RET demonstration projects

Amount: \$ 11,210

Location: Male', with internal travel in Maldives

Description:

- Work under the guidance of the Chief Technical Advisor (CTA) and the National Project Director (NPD)
- Evaluate the performance of each demonstration project (activity 6.7):
 - Reviewing and analysing monitoring reports of the project operators on operation and maintenance
 - Collect information on management, administrative organisation
 - Collect opinions and information on stakeholder participation
 - Analyse operating and economic performance as well as energy and environmental impacts
 - Analyse technical and non-technical barriers that have hindered the functioning of the project
 - Prepare comprehensive evaluation report

Qualifications:

- Ability and experience to draft questionnaires, implement surveys and analyse survey data
- Proven experience in monitoring and evaluation of technical and/or demonstration projects
- Subcontractor may be international or national, but should have or liaise with local staff

Deliverables:

- Comprehensive report, containing methodology and results of the evaluation, compilation of lessons learned and recommendations for future replication

10. Elements of training in RETDAP

Tentative programme of training and workshops:

	GEF contribution [USD]	
	Travel abroad	Training cost
<u>Advocacy and awareness (activity 2.1)</u>		
• Workshop for government officials and private sector staff (kick-off workshop)		2,970
• Training on RE systems for OIA people		3,900
• Study tour for government and private sector decision makers	16,000	10,000
<u>RE policy development and institutional strengthening (activity 3.7)</u>		
• Participation in workshop/training abroad on RE policy issues and options and institutional building	8,000	5,000
• Seminar on implementation of national energy plan, regulatory and incentive measures		3,000
<u>RE technical capacity building (activity 4.6)</u>		
• Participation in workshops and short courses in Maldives and abroad on design, operation and maintenance and feasibility analysis of RETs	36,000	23,950
<u>RE project financing schemes (activity 5.1)</u>		
• Training course on RE projects and RE-based productivity projects financing for governmental, financial and business people in Maldives and participation in workshops abroad	8,000	5,000
<u>RE project development (activities 6.3 and 6.8)</u>		
• Training on RE project development and management	8,000	5,000
• National workshop		3,000
TOTAL:	76,000	61,820

