

REPUBLIC OF MALDIVES
SCALING-UP RENEWABLE ENERGY PROGRAM FOR LOW INCOME COUNTRIES (SREP)
SCOPING MISSION
JANUARY 24-27, 2011

AIDE-MÉMOIRE

I. INTRODUCTION

1. A joint Multilateral Development Bank (MDB) team comprised of the Asian Development Bank (ADB) and World Bank Group (WBG)¹ visited Maldives for a Scoping Mission of the Scaling-Up Renewable Energy Program (SREP) from January 24 to 27, 2011. The Government of Maldives was represented by the Ministry of Housing and Environment (MHE) which is the designated lead agency for SREP activities. The joint MDB team met with the Ministry of Finance and Treasury (MFT) and other government agencies, the President's Office (PO), United Nations Development Programme (UNDP), Japan International Cooperation Agency (JICA), private sector stakeholders, and the utility companies, namely State Electric Company (STELCO), Upper North Utilities, Northern Utilities, Central Utilities, South Central Utilities, Southern Utilities, and Upper South Utilities. A complete list of stakeholders met is attached as Annex I.

2. The joint MDB team would like to express its appreciation to MHE for the productive discussions and organization of the Scoping Mission, as well as to the PO and all government agencies and stakeholders for productive discussions on SREP. This Aide-Memoire summarizes the mission findings, agreements reached, and next steps for the Joint Mission.

3. The objectives of the Scoping Mission were to:

- (i) Identify key development partners and other stakeholders who should be consulted in the course of preparation of the Investment Plan (IP). This exercise should also lead to identification of potential SREP co-financiers;
- (ii) Undertake a stocktaking of existing activities and documentation available on a range of analytical, strategic and programming activities related to renewable energy, which are considered important aspects of preparing the IP;
- (iii) Agree on a timetable as well as financial and human resources required to prepare the IP; and
- (iv) Agree on the outline of the IP.

II. ENERGY SECTOR BACKGROUND

4. The Maldives is almost completely dependent on fossil fuel imports for power generation which presents a challenge to the goal of carbon neutrality by 2020. Fossil fuels, primarily petroleum, provide the majority of energy used in the Maldives for generation of electricity (diesel), road and marine transport (gasoline, diesel), aviation (jet kerosene), and cooking, hot water and other uses (Liquefied Petroleum Gas, kerosene).

¹ The mission was comprised of the following from Asian Development Bank: Jiwan Acharya (SREP Focal Point), Len George (Energy Specialist / Program Leader for Maldives), Priyantha Wijayatunga (Senior Energy Specialist / Regulatory Expert); from The World Bank: Gevorg Sargsyan (Program Coordinator, CTF/SREP), Abdulaziz Faghi (Operations Officer / Program Leader for Maldives) and Anil Cabraal (Renewable Energy Expert). From International Finance Corporation: William Trant Beloe (Senior Operations Officer) and Kanchana Gayani Abeywickrama (Associate Operations Officer). Malcolm Cosgrove Davies (Lead Energy Specialist and Acting Sector Manager, South Asia Energy Unit, The World Bank) and Yongping Zhai (Director, Energy Division, South Asia Department, ADB) joined the mission on select meetings.

5. Renewable energy use is minimal beyond solar water heating in resort islands. In 2009, average electricity consumption in the inhabited islands was 400 kilowatt-hour (kWh) per inhabitant (excluding resorts). In the Male' region, it was 1,678 kWh/inhabitant. Per capita electricity consumption is relatively uniform except in a few islands due to high industrial activity, higher living standard and economic activity, and higher housing energy consumption in islands affected by the 2004 tsunami. These high energy consuming islands include Male' Greater Area, Vaikaradhoo, Kudarikilu, Himmafushi, and Vilufushi. Estimates available from the resort islands indicate the following composition of electricity consumption: air conditioning (~40 %), freezing (~10 %), desalination (~10 %), lighting (~10 %), and laundry (5-20%)².

6. BeCitizen (a member of the Benjamin Rotschild group) conducted a recent study³ for the Maldives that pegs carbon emissions in the Maldives at about 1.33 Million tons of CO₂ equivalent in 2009. Approximately 0.87 Million tons of CO₂ equivalent from the total volume of emissions was a result of diesel consumption for electricity generation and transportation. The study also indicated that energy consumption accounted for nearly 1.07 Million tons of CO₂ equivalent with the largest share being attributed to electricity generation at 0.55 Million tons of CO₂ equivalent (or 51%). From an economic perspective, imported fossil fuels accounted for more than US\$ 200 Million in 2009, which was equivalent to 15% of the country's Gross Domestic Product (GDP) the same year. It is expected that introduction of such measures would also open up additional opportunities for entrepreneurship, and relieve the fiscal burden imposed by government-subsidized fuel oil. A list of additional relevant reports and studies for Maldives is attached as Annex III.

7. Historically, Maldives had a very fragmented electricity sector with each island having its own electric power generation system and other basic infrastructure. Electricity in Maldives has been traditionally provided by four different types of suppliers, namely the State Electric Company (STELCO), Non Government Organizations (NGOs), Island Development Committees (IDCs) and Independent Power Producers (IPPs). Resort islands operate their own captive systems. Most inhabited islands have had their own IDCs or IPPs to provide electricity to the local community from fuel-driven generators with installed capacity ranging from less than 100 kilowatt (kW) to 2-3 megawatt (MW). Recently, the government has established six regional utilities - in addition to STELCO - to provide electricity and other services including water and sewerage and has started a process of consolidating the power sector.

III. SREP IN MALDIVES

8. Maldives was selected by the SREP sub-committee as one of six pilot countries to receive funding for financing renewable energy investments in the country. In June 2010, the SREP sub-committee agreed on an indicative allocation of up to \$30 million for Maldives, which are expected to leverage, additional resources on a scale of 1:4 (or approximately US\$120 million). The additional funds would expectedly be mobilized by MDBs, bilateral donors and more notably the private sector. Maldives is also eligible to potentially access additional (up to US\$ 60 million) SREP resources which are available in reserve. However, the reserve fund can be accessed by each of the six pilot countries based on defined criteria which will be developed by the SREP sub-committee.

9. The SREP priority is to support renewable energy technologies which have gone beyond pilot phase and which are also economically viable but also have developmental impact. While SREP funds are intended to support renewable energy technologies, energy efficiency investments might be

² Carbon Audit Report 2009 prepared by BeCitizen.

³ Carbon Audit Report 2009 prepared by BeCitizen.

considered eligible for the co-financing. In addition, inter-island connectivity, which will contribute to developing renewable energy, can be also eligible subject to confirmation by the SREP sub-committee.

10. ADB at the request of MHE provided a consultant to assist the Task Force for pre-investment plan support mainly to aggregate and consolidate available data and studies previously carried out in Maldives and to develop an indicative roadmap for reducing energy sector carbon emissions. The initial findings were presented to MHE by the consultant during the Mission.

IV. SUMMARY OF MISSION FINDINGS AND AGREED ACTIONS

A. Energy Sector Regulatory Framework:

11. An active regulator engaging in licensing, compliance monitoring, data collection, pricing, oversight of investment planning, etc. would be critical to the overall development of the energy sector in Maldives. The current sectors being regulated in Maldives are telecommunication, transport, water, sanitation and energy. Apart from the telecom regulator, the other regulators are hampered by a lack of capacity and resources. The Maldives Energy Authority (MEA) has the remit of regulating the energy sector but is constrained to regulating the activities of STELCO and part of the activities of the regional utilities. MEA in its current form lacks the proper regulatory framework and legal mandate to effectively regulate the sector.

12. A workshop organized by MHE, was held in parallel to the Scoping Mission to review the existing regulatory arrangements in various sectors in the Maldives and present options on possible regulatory structures for the energy sector. The options analysis study was funded by the World Bank-managed Energy Sector Management Assistance Program (ESMAP)⁴. Stakeholders including utilities, private sector and the government underscored the need for an independent multi-sector regulator for the Maldives with a role in licensing, compliance monitoring, data collection, tariff determination and oversight of investment planning and development. As a statutory body with decision making powers, the regulator would need to be funded through regulatory levies and operated by professional staff outside the civil service. The Minister of MHE as well as the President's Office staff endorsed the findings and recommendations of the workshop.

B. Designated Lead Agency:

13. GoM has appointed MHE as the lead agency for SREP engagement. Mr. Ahmed Ali, Deputy Director, Climate Change and Energy Department, has been designated as the focal point at MHE. A Task Force representing various stakeholders was also setup by GoM under the leadership of MHE and comprising GoM officials, utility representatives, MEA and other stakeholders to support the preparation of the SREP IP. MHE will ensure close coordination between government agencies, the PO, the MDB team and other stakeholders on SREP activities. In addition, MHE and the Task Force will be supported by consultants and experts whom will assist with preparation of the SREP Investment Plan.

C. Potential Areas of Engagement:

14. The Mission discussed possible areas of engagement under SREP in Maldives, both technically and financially. With nearly all of the electricity being generated in Maldives through diesel and fuel oil, the transition to low carbon alternatives must be gradual. As energy efficiency is usually the

⁴ A list of relevant activities, partners and sources of funding for Maldives is attached as Annex IV

lowest cost means of avoiding electricity consumption, it must be a priority option. Near term technologies are likely to be mainly solar photovoltaic (PV) and small wind turbine hybrid schemes. Given that both wind and solar technologies generally provide intermittent power, they would have to be combined with diesel back-up and batteries (forming a dispatchable hybrid system) to meet the consumers needs. Use of waste heat or solar thermal for desalination, refrigeration, and hot water are options that also may have promise on selected islands.

15. Municipal waste and sewage biodigestors could be attractive as solid waste has high organic content (including from fish processing plants and municipal waste) and also produces important co-benefits of environmental improvement and production of organic soil conditioners. Biomass-based thermal generation using locally generated waste or biomass has little potential (perhaps only in Male' and a few of the larger islands or clusters of islands) as there is not enough waste generated or suitable land available for growing biomass crops, to produce a sufficient feed stock. Other renewable resources, such as biomass, bio-coal or bio-diesel would need to be imported. These options will be further studied during the course of the preparation of the IP.

16. The Mission outlined some of the IP options for channeling SREP funds. Examples of those are:

- Public-Private Partnerships (PPPs) where GoM enters into a concession agreement with private developers on a turn-key basis to supply renewable energy systems;
- Channeling funds through utilities that will supply, install and commission a system and be responsible for its operation and maintenance;
- Power Purchase Agreements (PPAs) between the utilities and private developers who would supply, install and operate renewable energy power plants under the terms of the PPA;
- Utilizing financial intermediaries (such as local Banks, Funds or Credit agencies); or
- A combination of one or more of the above.

17. Given the generally modest electricity demand and geographic spread of the Maldivian islands, the possibility of interconnectivity may not be feasible with perhaps very limited exceptions. Therefore, potential SREP investments are expected to be in the form of independent mini-grids for each island or group of islands (if interconnectivity is reasonably and justifiably cost effective). In addition to supporting renewable energy investments, there will likely be a need for capacity building and technical assistance to support these investments.

18. Capacity building and technical assistance may include support to key implementing agencies; project implementation support; developing standardized or model PPAs; resource monitoring; technology assessment; planning support; standards and labeling programs and their enforcement; policy and regulatory support; and information dissemination. GoM agreed during the Mission that SREP investments can be mainly channeled through the utilities and therefore it was essentially for these institutions to build capacity not only to implement potential SREP investments but for future management and operations of their own power systems in their respective regions.

D. Consultations with Relevant Stakeholders

19. Consultations were held with government agencies, private sector, and commercial banks to explore the barriers to renewable energy development in Maldives and approaches for leveraging SREP funds to address these barriers. Lack of consumer awareness, a weak regulatory system, absence of favorable government policies, lack of access to long term financing, weak capacity within the utilities, and lack of long term renewable resource data were reported as the key impediments. A summary of consultations with the various stakeholder groups is attached as Annex II.

E. Agreed Actions with GoM:

20. Following completion of the Scoping Mission, a Joint Mission will be fielded for the purpose of completing the consultation process with key stakeholders and identification of potential co-financiers of SREP. During the Joint Mission, a preliminary draft IP should be ready for discussion with GoM including the initial ideas of projects to be supported by SREP. There are several key steps needed to prepare for the Joint Mission⁵. These are grouped into three stages: (i) before the Joint Mission, (ii) during the Joint Mission, and (iii) after the Joint Mission, through the presentation of the IP to the SREP Sub-Committee. Task responsibilities and schedule are provided at the end of this section.

Before the Joint Mission:

21. Finalize the Terms of Reference (ToR) for preparing the IP. The draft ToR for preparing the IP along with the suggested outline of the plan is attached as Annex V. The work will be built on the pre-investment plan road map developed by the ADB-funded consultant (see paragraph 10).

22. Decide whether additional funds from SREP Preparation Grant will be required to finalize IP. Up to \$1.5 million may be used to complete the IP and for capacity building and advisory services, including stakeholder consultations and planning work. Any funds used for this purpose would be included in the SREP funding allocated to the Maldives. The funds can be requested either as part of the Joint Mission ToR submission or after the Joint Mission. In addition, an advance of \$375,000 from the \$1.5 million can be accessed immediately. With the availability of other resources to prepare the SREP IP (see Annex III), GoM have not confirmed their intent on applying for a preparation grant from the SREP allocation. A decision will be made shortly after the Scoping Mission whether the existing resources - mainly from the World Bank managed multi-donor Maldives Climate Change Trust Fund (CCTF) - would be sufficient to complete the work needed for the IP. The Mission confirmed that GoM is not obligated to apply for the preparation grant and that funds do not expire but rather will remain as part of the total SREP funding envelope for Maldives.

23. Initiate procurement of consultant(s) to finalize the IP. GoM will need to decide whether it would prefer to use individual consultants or a consulting firm to perform the work. Individual consultants can be procured more quickly but will require more substantial coordination by the Government to ensure consistency in the methodology of the IP analysis and outputs.

24. Select the preferred option for the energy sector regulatory framework. GoM should select the most suitable option for regulating the energy sector and proceed with developing a detailed regulatory framework. In order not to delay investments, regulation by contract or public sector investment approaches can be used as an interim measure until the regulatory framework is created and regulatory institutional capacity is strengthened. Resources and funding to carry out these tasks are expected to be made available to GoM by the World Bank through ESMAP and ADB's Capacity Development Technical Assistance (CDTA) program.

25. Prepare the ToR for the SREP Joint Mission. The ToR for the Joint Mission and administrative arrangements for the program preparation grant must be completed and the technical assistance initiated, with adequate work carried out to enable the Joint Mission to proceed effectively. A ToR for the Joint Mission will be prepared jointly by GoM and the MDBs. The ToR will be posted on the Climate Investment Fund (CIF) website four weeks in advance of the Joint Mission. This is to allow bilateral and multilateral donors and other interested stakeholders the opportunity to be informed of

⁵ A copy of SREP Scoping Mission presentation, including the process steps hereafter is provided in Annex VI

SREP programming plans and to participate in consultations and other aspects of the Joint Mission, as appropriate.

26. GoM would need to have the following information assembled and studies completed before the Joint Mission can take place: (i) preliminary identification and characterization of a set of priority investments and technical assistance to be considered in the IP; (ii) compilation of data on electricity consumption, load profile, load growth forecast; (iii) identification of other donors or investment partners who have expressed interest and willingness to co-finance and levels of financing such partners would be willing to commit and timing of availability of such funds; (iv) identification of key implementing agency or agencies and their roles and responsibilities.

During the Joint Mission:

27. Conduct the first Joint Mission: Once the necessary activities preceding the Joint Mission have been completed, the Mission will be scheduled and carried out. During the mission, GoM and MDB priorities, links between SREP and other initiatives (including parallel/complimentary investments by the MDBs and other co-financiers), and the strategic role of the proposed SREP investments will be identified and agreed among the Government and all other partners. This exercise will be carried out in a participatory and consultative manner, so that all key stakeholders will have an opportunity to share their views on how best the SREP resources can be used to support Government plans for scaling up renewable energy programs in the country and in particular on the goal to achieve carbon neutrality.

28. The main outputs expected from the Joint Mission are: (i) completion of a consultation process engaging key stakeholders in the design of SREP support to Maldives; (ii) identification of potential co-financiers; (iii) discussion of preliminary draft SREP IP document; (iv) a report documenting next steps for finalizing the SREP IP; and (iv) initiation of preparation of projects to be supported by the IP.

After the Joint Mission:

29. Finalize SREP IP. Following the Joint Mission, the draft Investment Plan will be refined and finalized by the GoM in consultations with the MDBs. This could potentially require further stakeholder consultations and additional missions by MDBs should new issues arise or any issues remaining from the Joint Mission still need to be resolved. When a draft final version of the SREP document is ready, this will be published by the Government on the web for public consultations. In parallel, the involved MDBs would prepare their own necessary project preparation documentation based on the draft IP and undertake internal quality reviews. The MDBs would provide comments to GoM on the draft IP. An independent expert may also be engaged in the review process. The revised IP will be shared with the CIF Administrative Unit for review and comment. Taking account of any inputs, a final SREP IP will be prepared and transmitted to the CIF Administrative Unit for posting according to agreed CIF guidelines.

30. Organize a Donor/Investor Conference. The mission discussed the importance of conducting a donor conference to inform bilateral and multilateral financiers as well as private financiers and investors about the Maldives carbon neutrality plans and present them with an opportunity to pledge support and additional resources to finance SREP projects. Prior to the donor conference, GoM will prepare a prospectus of investments and technical assistance for which support is sought. The timing of the donor conference will be agreed between GoM and MDBs. but it is expected to hold it as soon as the draft IP is available.

31. The MDBs will consult with MHE to organize and schedule follow-up actions to the Joint Missions. Substantive and comprehensive discussions in this regard are expected to be conducted during the Joint Mission itself.

32. Timeline for Joint Mission and Preparation of the IP. GoM proposed a timetable for the preparation and completion of the IP. GoM is planning to present the IP for approval by November 2011; however, GoM will make every effort to finalize the IP earlier. The following is a tentative schedule for the upcoming Joint Mission dates and next steps towards completion of the IP:

Action	Responsible Agency	Tentative Date(s)
Finalize the ToR for preparing IP	GoM Task Force	Feb 28, 2011
Decide on IP preparation grant	GoM Task Force/MHE	Feb 28, 2011
Initiate procurement of IP consultant(s)	GoM Task Force/MHE	Feb 28, 2011
Select an option for energy sector regulatory framework	President's Office	March 5, 2011
Finalize ToR for Joint Mission	MDBs and GoM Task Force	March 10, 2011
Conduct Joint Mission and discuss first draft IP	MDBs and GoM Task Force	April/May 2011
Donor / Investor conference and Second Joint Mission	MDBs and GoM Task Force	August/September 2011
Publication of IP for public consultations and submission for formal review by MDBs	MDBs and GoM Task Force	September 2011
Submission of IP to CIF AU	Task Force	October 2011
Approval by SREP Sub-Committee (expected)	GoM	November 2011

V. ANNEXES

- I. List of stakeholders met
- II. Summary of consultations held with relevant stakeholders
- III. List of relevant activities, partners and sources of funding for Maldives
- IV. List of relevant reports and studies on Maldives
- V. Draft ToR for development of clean energy investment plan
- VI. SREP Scoping Mission presentation

LIST OF STAKEHOLDERS MET

Name	Designation
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----- **GOVERNMENT STAKEHOLDERS** -----**The President's Office**

Ms. Aminath Shauna	Deputy Under Secretary
Mr. Mike Mason	Energy Advisor to the President

Ministry of Housing and Environment

Mr. Mohamad Aslam	Minister
Mr. Akram Kamaluddin	State Minister
Mr. Saleem Ahmed	Permanent Secretary
Mr. Ahmed Ali	Deputy Director, Climate Change and Energy Department
Mr. Ali Shareef	Assistant Director, Climate Change and Energy Department
Ms. Aminath Athifa	Deputy Executive Director
Mr. Akram Waheed	Assistant Engineer, Climate Change and Energy Department
Mr. Amir Musthafa	Assistant Environmental Engineer
Mr. Mohamed Azim	Assistant Planner
Mr. Ahmed Anwar	Environment Analyst
Mr. Mohamed Rameez	Environment Analyst
Mr. Mareer Mahamed Husny	Environment Analyst
Mr. Mohamed Asif	Environment Analyst
Mr. Abdul Rasheed	Assistant Electrician

Ministry of Finance and Treasury

Mr. Ahmed As-ad	Minister of State for Finance and Treasury
Mr. Mohamed Amir	Deputy Minister
Mr. Arif Rasheed	Senior Account Officer
Ms. Aminath Manik	Director General
Ms. M. Fazleena Mustafa	Senior Accounts Officer

LIST OF STAKEHOLDERS MET

Name	Designation
Maldives Environmental Protection Agency	
Mr. Ibrahim Naeem	Director
Mr. Ibrahim Mohamed	Assistant Director
Maldives Energy Authority	
Mr. Mahmed A Latheef	Board Member
Mr. Thoriq Ibrahim	Board member
Mr. Ajwad Mushtafa	Deputy Director
Mr. Ibrahim Athif	Senior Engineer
Mr. Ahmed Iqbal	Senior Engineer
Mr. Hussain Asif	Senior Administrative Officer
Mr. Ahmed Shifaz	Assistant Accounts Officer
----- STATE UTILITY COMPANIES -----	
State Electric Company Limited	
Mr. Mohamed Rasheed	Chief Executive Officer
Mr. Zaid Mohamed	Chief Technical Officer
Mr. Adnan Ibrahim	Deputy Director
Mr. K. Sivathan	Financial Controller
Mr. Ibrahim Nizam	Engineer
Northern Utilities Limited	
Mr. Ali Hassan	Managing Director
Mr. Ali Majid	Director Planning & Development
Mr. Ahmed Shamoon	Director Finance
Upper North Utilities Limited	
Mr. Usaamath Abbas	Senior Executive
Mr. Abdul Gayoom	Engineering superintendent

LIST OF STAKEHOLDERS MET

Name	Designation
Central Utilities Limited	
Mr. Ahmed Nafiz	Operational Manager
South Central Utilities Limited	
Mr. Adam Ali Manik	Technical Director
Southern Utilities Limited	
Mr. Ahmed Zareer	Chairman
Upper South Utilities Limited	
Mr. Ahmed Shareef Nafees	Chairman
Mr. Ahmed Saeed Ohamed	Managing Director
Mr. Hussain Hameez	Technical Director
----- PRIVATE SECTOR -----	
Renewable Energy Maldives	
Dr. Ibrahim Nashid	Chairman
Mr. Abdul Rahman Ali	Managing Director
Housing Development Finance Corporation	
Mr. A.D.P. Baddevitaana	----
Maldives Finance Leasing Company	
Mr. Mohmed Giyas	----
Mr. D.Soosaid Iuui	----
Linear Tech	
Mr. Humayun Kabir	----
Mr. Mohmed Luthfee	----
----- DEVELOPMENT PARTNERS -----	
United Nations Development Program	
Mr. Andrew Cox	UN Resident Coordinator / UNDP Resident Representative
Mr. Mohamed Inaz	Assistant Resident Representative, Environment & Energy
Japan International Cooperation Agency	
Mr. Katsumata Yuji	Resident Representative

SUMMARY OF CONSULTATIONS HELD WITH RELEVANT STAKEHOLDERS

a) Consultations with Government Agencies

The President's Office.

1. The PO is also keen on establishing a learning center and to serve as a common forum for discussing best practices on projects, technologies and knowledge sharing as it relates to climate change activities and the Maldives goal of carbon neutrality. It would be essential for GoM to set a clear roadmap for addressing the challenges ahead in implementing SREP investments, be it technical, capacity building or obtaining the best cost of capital for these investments. For the latter, a workshop could be organized to focus on addressing this issue, which may be combined with the proposed Donor Conference described in paragraph 30 of the main text.
2. Establishing a regulatory framework and building capacity of that institution are essential for the Maldives to efficiently operate the energy sector. The decision to select an appropriate regulator for Maldives will be crucial and it is important that internal discussions are held within GoM to reach a conclusion on what is feasible in Maldives technically, economically and legally. Examples of these decisions would be on whether to create a new statutory body vs. empowering existing institutions such as MEA) to oversee these functions. Another option to consider is whether it is more feasible to have single-sector (energy only) vs. multi-sector regulation (e.g. energy, water and others). For any of the above scenarios, it would be important that the regulatory authority is both competent, maintains the technical expertise and is granted independence and authority to exercise its mandates.

Ministry of Housing and Environment.

3. MHE has commenced preparation of a roadmap to achieving carbon neutrality. Several options exist including adopting energy efficiency measures and development of renewable energy projects. The Taskforce identified a range of energy efficiency initiatives including energy conservation in resorts, water desalination, households and public sector buildings; and utilization of waste heat from diesel generating sets that could reduce energy sector carbon emissions. In addition, certain options for renewable energy including solar power generation, wind power generation, solar heating and biomass as well as their carbon reduction potential were reviewed by the Taskforce.
4. While a decision on eligibility of using SREP funds for energy efficiency is not yet confirmed, GoM may utilize additional funds being leveraged through SREP on 'quick-fixes' in energy efficiency. Moreover, there are a number of simple policy actions which GoM could take to improve its energy security, for example, i) national labeling programs (~30-40% in energy savings); ii) utilizing waste heat from diesel genset (contributing ~40% of heat for water desalination); and iii) applying regulations to the resort islands to generate more from renewable sources, although the latter is largely aimed at reducing the carbon footprint associated with the neutrality goal.
5. The Mission also concluded that softer financial interventions in Maldives may be appropriate. For example, the use of Guarantee instruments such as Partial Credit (or Partial Risk) Guarantees (PCGs/PRGs) would allow GoM to cover private lenders against the risk of debt service default (or failure to meet contractual obligations) by government or public sector borrowers. Discussions on types of lending instruments and choices available for Maldives should be important elements to the SREP IP to assist GoM with maximizing on available resources for SREP investments.

SUMMARY OF CONSULTATIONS HELD WITH RELEVANT STAKEHOLDERS

Ministry of Finance and Treasury.

6. The Ministry sees tremendous value in building capacity of the utilities and is keen on seeing that these resources are developed for the benefit of the power sector. It was also clear that privatization of the utilities is a goal that GoM would like to achieve; however, it recognized that this would be a long term objective given the relative infancy of the newly-formed regional utilities. The indiscriminate signing of PPAs by the utilities with investors should also be reviewed carefully by MFT to ensure that the country is maximizing the return on these investments and inordinate risks are not transferred to the GoM. Refer to section b) below for details on consultations with STELCO and regional utilities.
7. GoM could also use SREP funds to finance in the incremental cost of capital. This way, the utilities would ultimately receive lower, competitive bids for pricier technology options because SREP funds would be used to finance the incremental cost of capital in the form of a subsidy to the investments proposed by developers. With demand for electricity outstripping supply, it is imperative that GoM ensures continuity of supply and services to consumers, helping the utilities improve their efficiency along the way. The SREP IP should provide a mechanism for effective use of subsidies and cost recovery tariffs for renewable energy investments.
 - b) *Consultations with state utilities.*
8. STELCO. The utility currently pursuing a few renewable energy interventions but has no experience or capacity to evaluate these projects including a solar project PPA which was awarded to develop 6 islands (excluding Male'), a 1 MW distributed generation which would make up 20-30% of the total capacity of all 6 islands combined. In addition, a tender is also being floated to supply 15-20 MW of dispatchable renewable energy investments to the Greater Male' Region including storage and back-up, and another tender which allows the developer to set the most appropriate technology for investment.
9. This approach of multiple tenders without clear guidance to prospective bidders coupled with lack of accurate data available to prospective bidders on wind and solar data, load composition, consumption by usage (e.g. lighting, water heating, air conditioning, etc.) is not guaranteed to yield the best possible methodology to follow for the utility and the ultimate beneficiaries. One risk would be that investors would develop their own assumptions on renewable energy potential and inflate their financial proposals to hedge against unverifiable data.
10. STELCO is also keen on developing a 'master plan' for their investments which would also outline the methodology for supporting GoM's carbon neutrality goal. They also see benefit in establishing a national center to support technical capacity building, including drafting appropriate PPAs, designing energy conservation awareness programs for various public consumer groups. This also resonates well with the GoM.
11. Regional Utilities. The pool of state-owned utilities (Northern, Upper North, Central, South Central, Southern and Upper South) is performing relatively well at managing the day-to-day operations of their regional systems; however, they currently lack long-term strategies for institutional development as well as investing in renewable energy to displace fossil fuel generators. Below is a brief list of key issues and concerns raised by the utilities:
 - Exploring the use PV with batteries and bio-diesel (in spite of high cost of supply);

SUMMARY OF CONSULTATIONS HELD WITH RELEVANT STAKEHOLDERS

- Central: issues with non-operating power houses, wind turbines, etc.;
 - Lack of tariffs set by MEA;
 - Many islands simply generating power through the local persons or businesses making it difficult for utilities to gain control over these systems and operate them effectively;
 - High fuel and usage subsidies result in less affordable electricity for consumers;
12. All utilities are cognizant of the need for building their internal capacity not only to manage the existing networks under their purview but also carry out more efficient and effective system planning for new investments, especially in the area of renewable energy. As discussed in paragraphs 8 and 9 above, there is a lack of clear long term planning by the utilities as PPAs are signed for capacities that far exceed the peak demand for the intended islands with terms and conditions (including tariffs and agreement on dispatchable vs. intermittent supply) sometimes questionable.
13. The utility companies would greatly benefit from a workshop or knowledge sharing on capital supply choices, on how to obtain the best cost of capital for their projects. Currently, utilities cannot raise their own funds for investments and so the cost of capital concept does not exist. However, GoM can explore the possibility of using SREP funding to provide a subsidy to reduce cost of generation when utilities enter into PPAs or could be used as a guarantee instrument to cover political, commercial or contractual risks.

c) Consultations with Private sector

14. The tourism sector - mainly resort islands – must somehow be engaged in order to support the GoM’s goal of achieving carbon neutrality. Private firms such as Renewable Energy Maldives (REM) are already conducting Cleaner Production audits in some resorts but it is very difficult to get the attention of the resorts to implement. If a few of the resorts convert to renewable energy or adopt energy efficiency practices the other resorts might follow suit. One resort has pledged to reduce diesel use by 70 percent. According to REM the resorts are constrained by lack of long term funding for implementation as well as in providing guarantees for their overseas investors. A phased approach where resorts are given a time frame to comply with energy regulations complemented with demonstration could be considered. These could include, pilot projects to help to change their attitude towards adopting energy efficiency practices and encouraging / requiring renewable energy use through regulatory measures or incentives.
15. The Housing Development Finance Corporation (HDFC) and Maldives Finance Leasing Company (MFLC) were also part of the private sector discussions. Both mentioned that creating awareness of the savings to households through pilot projects or demonstrations will be important to spread the message. HDFC stated that a revolving fund to provide loans to households to purchase energy efficient appliances or to install solar powered air conditioning units etc would be beneficial since the appliances are too expensive for households to buy in cash.
16. The private sector also believes that lack of verifiable country-wide wind and solar data is constraining GoM from engaging in mutually beneficial discussions with possible investors. In addition, data related to consumption (Male’ and other islands, cost curves for different technologies, supply and subsidy information, financial data of utility companies, etc. need to be collected during the preparation of the IP.

SUMMARY OF CONSULTATIONS HELD WITH RELEVANT STAKEHOLDERS*d) Consultation with Development Partners*

17. UNDP is the most active agency in promoting renewable energy in Maldives and has implemented pilot projects on a number of islands. There is wide interest in developing a more integrated approach to climate change development in the Maldives and more work is envisaged for an integrated atoll program coupled with human development and capacity building of relevant stakeholders and government agencies in the Maldives. UNDP is also active in providing advisory services, market analysis. There is also interest in promoting carbon finance in the country and are keen to leverage/collaborate where it makes sense. They also acknowledge the importance to not underestimate the lack of capacity across the board and to recognize that where there is indeed capacity, it is overstretched. The mission also met with JICA's Resident Representative who joined a number of meetings with various stakeholders.

LIST OF RELEVANT ACTIVITIES, PARTNERS AND SOURCES OF FUNDING FOR MALDIVES

Title of Program / Activity	Description of Funded Activities	Funding Source	Amount (US\$)
Maldives Climate Change Trust Fund (CCTF)	Preparation works and investments in wetlands and mangrove habitats conservation, reef ecosystems, and renewable energy investments on Thinadhoo island.	European Commission, AusAID administered by the World Bank	9,500,000 (up to 30% for climate mitigation)
Developing a regulatory framework for Maldives energy sector	Regulatory options analysis and support towards developing a detailed regulatory framework	Energy Sector Management Assistance Program (ESMAP) Administered by the World Bank	200,000
Solar Energy Development in South Asia (related to ADB's Asia Solar Energy Initiative)	Regional capacity development technical assistance program for South Asian countries on solar energy development. Specific sub-projects for the Maldives are being considered under this Technical Assistance.	Asian Development Bank	1,400,000 (Overall)
Capacity Development for Maldives Energy Authority	This will include support on developing institutional capacity to undertake the expected requirements in the areas of licensing, compliance monitoring, data collection, tariff decision making and oversight of investment planning and development– some of which would be directly relevant for the development of renewable energy projects.	Asian Development Bank	300,000 (allocation for Maldives)
Towards Carbon Neutrality in Maldives – knowledge exchange on sustainable renewable energy policy	Study tours to similar island states to learn from their experiences with developing and implementing sustainable renewable energy policies, engaging private sector and increasing the share of renewable energy in the power generation mix.	South-South Experience Exchange Trust Fund administered by the World Bank	125,000

LIST OF RELEVANT REPORTS AND STUDIES ON MALDIVES

1. Lara Kesterton, *An investigation into the policies, technologies and economics of achieving clean electricity in a small island in the Maldives*, Thesis, MSc Environmental Change and Management, Oxford University, September, 2010
2. BeCitizen, *Maldives's 2009 Carbon Audit* prepared for the President's Office of the Maldives and the Ministry of Housing and Environment, November 2010
3. Renewable Energy and energy efficiency Partnership, Maldives Database Details, <http://www.reeep.org/index.php?id=9353&text=policy&special=viewitem&cid=45>
4. IT Power, *Feasibility Study of Small Scale Waste to Energy Incineration*, Report to Environment Research Centre, Republic of Maldives, December 2007.
5. Klaas van Alphen, Wilfried G.J.H.M. van Sark, and Marko P. Hekkert, *Renewable energy technologies in the Maldives—determining the potential*, Renewable and Sustainable Energy Reviews, 11 (2007) 1650–1674, February 2006
6. Dave Renné, Ray George, Bill Marion and Donna Heimiller (National Renewable Energy Laboratory), and Chris Gueymard (Solar Consulting Services), *Solar Resource Assessment for Sri Lanka and Maldives*, NREL/TP-710-34645, August 2003.
7. Mike Mason, CARBON NEUTRAL IMPLEMENTATION PLAN – INTERIM POLICY, 31 October 2010.

In addition, the following table provides a more comprehensive list of reports obtained from Lara Kesterton's report referenced above:

LIST OF RELEVANT REPORTS AND STUDIES

Report Title, Author	Date	Author	Subject Field ⁴²	Synopsis/ key notes	Reference/ source
			MIXED RE		
Final Report Assessment of Least-cost, Sustainable Energy Resources Maldives	23 Dec 2004	Energy Consulting Network in co-operation with: GasCon	Wind, Solar, Biomass, landfill gas		Commissioned by Fund for Danish Consultancy Services, Project INT/03/R11 – 02 MDV 1180 in relation to UNDP's REDTAP project.
Technical Report: Action Plan. Assessment of Least-cost, Sustainable Energy Resources, Maldives.	2004	Stobbe, Morten and Andersen, Nick of Energy Consulting Network	Wind, Solar, Biomass, landfill gas		Report by Energy Consulting Network commissioned in relation to UNDP's REDTAP project. Project INT/99/R11-02 MDV 1180.
Modelling of Renewable Energy Systems in the Maldives	2004	Julie Camerlynck	RETs, esp. wind and solar		Internal Internship report NWS-I-2004-21 Utrecht University
The Implementation potential of Renewable Energy Technologies in the Maldives	2004	Klaas van Alphen	Wind and solar	Techno-economic analysis of wind/solar/ and diesel hybrid systems. Plus assesses the dynamics of technological change fitting the Maldives within theoretical framework of Innovations System concepts. Paper aim to remove some of barriers to RE deployment. Paper discusses:	An internal research report Report: NWS-I-2004-22 Utrecht University, Netherlands following internship with UNDP and

⁴² Reports loosely order according to subject matter.

LIST OF RELEVANT REPORTS AND STUDIES

			<ul style="list-style-type: none"> - Barriers to RE/ Key stakeholders/ islands' energy needs - Theoretical framework to tech transfer (capacity building/ info dissemination, enabling environment and innovation systems) - Diffusion of technology is influenced by social, institutional and political factors. Paper uses Innovation Systems concepts (which uses qualitative analysis to include these factors in devising a comprehensive approach to RET transfer) to analyse the Maldives' diffusion process. - Technologies (PV/ Wind – physics and engineering are explained) - Evaluates availability of RE resources. - Uses HOMER to compare between different RE system components for 5 islands (including Male) using technical, financial, env. and social parameters. - Energy Analysis – energy output - Environmental analysis - Cost Analysis <p>Findings:</p> <ul style="list-style-type: none"> - 13% of electricity could be supplied economically by RE based systems (though this excludes resorts which account for c50% of energy consumption). - Hybrid systems more feasible/probable than 100% RE systems which aren't financially viable - Wind-diesel is more profitable than solar-diesel and RE % is higher in former but solar-diesel is easier to operate. - Assesses probability of adoption using multi-criteria analysis. <p>Recommendations</p> <ul style="list-style-type: none"> - Wide range of skills needed for PV & wind transfer. Maldivian government capacity is very limited due to complete fossil fuel dependency. Institutional strengthening is difficult due to many stakeholders in the energy sector. - Information dissemination on RE potential hampered by big knowledge gaps and nascent networks for disseminating info. - Commercial diffusion of RETs hampered by political risks e.g. weak 	Maldives' Ministry of Communication and Technology. Report supporting the EC's SMILES project
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LIST OF RELEVANT REPORTS AND STUDIES

				<p>legal protection and inadequate regulation. Enabling environment is thus lacking. No clear policies to support RE projects. Plus financial resources are limited in Maldives.</p> <ul style="list-style-type: none"> - Subsidies on the current electrical system and unequal tax burdens create false competition. 	
<p>Renewable energy technologies in the Maldives— determining the potential. Paper in Science Direct</p>	<p>1 0 Feb 2006</p>	<p>Klaas van Alphena, Wilfried G.J.H.M. van Sarkb, Marko P. Hekkerta</p>	<p>Wind and Solar</p>	<p>Summary of Klaas van Alphen's 2004 paper focussing on the economics and technical solutions.</p> <ul style="list-style-type: none"> • Paper discusses the quantification and evaluation of the potentials of available solar and wind resources in the country for electricity applications. • HOMER (the energy system modelling tool) was used to create optimal renewable energy (RE) system designs. • Technical design criteria of PV and wind systems are discussed based on load profile in 5 case study islands. • The current energy situation/ load characteristics are assessed. Investment and O&M costs of current and RE alternatives modelled. • Multi-criteria analysis is used to evaluate these different RE alternatives using a number of key criteria. • The evaluation shows that 100% RE system configurations are not financially viable in the Maldives while the RE-diesel hybrid systems could bring down the price of electricity with 5–10 \$cent/kWh in smaller outer islands. Assuming that these latter systems with a high probability of adoption are implemented, the results show that 10% of the electricity in the Maldives could be supplied by RE based systems in a cost effective way. 	<p>Published in ScienceDirect. Renewable and Sustainable Energy Reviews 11 (2007) 1650–1674</p>
<p>Renewable energy technologies in the Maldives— Realizing the potential</p>	<p>31 July 2006</p>	<p>Klaas van Alphen, Marko P. Hekkerta, Wilfried G.J.H.M. van</p>	<p>Wind and Solar</p>	<p>Summary of Klaas van Alphen's 2004 paper focussing on the social, institutional and political factors (i.e., the Innovation System) which greatly influence the implementation and use of even economically viable RETs.</p> <ul style="list-style-type: none"> • Article evaluates the RETDAP and SMILES projects by analyzing whether or not they strengthen the local Renewable Energy Innovation System. 	<p>Published in ScienceDirect</p>

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		Sarkb		<ul style="list-style-type: none"> Argues that these RE programs strengthen most of the key processes necessary in an Innovation System conducive to technology transfer. However, as not enough attention is being paid to local entrepreneurial activities and the creation of a domestic market for RETs, the process of RET transfer might run the risk of stagnation after completion of the RE programs. 	
MID-TERM REVIEW Maldives: Renewable Energy Technology Development and Application Project (RETdap)	25 Sept 2007	Jan van den Akker And Marie Saleem	Wind, solar, Biomass	<p>RETdap was designed to address and lower the identified major barriers blocking the widespread development and application of RE based systems that can supplant part of the fossil fuel use in the Maldives. Project started from a baseline of 'almost zero activities on RE in Maldives'.</p> <p>The report documents the steps taken (and many still pending) to address the following 6 key outcomes sought: The Project Document states six outcomes:</p> <ol style="list-style-type: none"> 1. <i>RE advocacy and awareness</i> (re. benefits of utilizing RE); 2. <i>RE resource assessment</i> (✓ ECN made detailed assessment of RE (wind/solar/biomass) potential and feasibility); 3. <i>RE policy development and institutional strengthening</i> (design and implementation of appropriate policies and interventions addressing the various barriers to RE development and use. ✓ energy supply and demand balance was constructed + draft energy policy was created); 4. <i>RE technical capacity building</i> (emphasis on the design, development, financing, implementation and management of RE projects) (* little implementation); 5. <i>RE Project Financing Schemes</i> (training private and public financial institutions on evaluating RE projects. RE Fund was established and financing scheme established + financing assistance made available via govt energy ministry) (✓ \$8m fund established and run by ministry (now MHE) but * few loans have so far been made); 6. <i>RE System Project Development</i> (techno-economic feasibility of RE-based energy projects via demo plants) (✓ solar-diesel hybrid system on Mandhoo Island was established, then closed (*)) because of 	The project is co-financed by the Global Environment Facility (GEF) with the United Nations Development Programme (UNDP) as the implementing agency and the Ministry of Environment, Energy and Water (MEEW) as the national executing agency.

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				technical issues, yet since reopened). Assessment that 55% of project outcomes have been implemented. Project now closed save for the funding stream is still open but run by the Government and poorly advertised. UNDP discussed that it was a science project designed to kick start RE take-off and now superseded by Government's carbon neutral programme which makes takes RE options into the commercial realm.	
Design and specification of pilot hybrid systems	2003	Energy Consulting Network	Wind, Solar, Biomas		Report by Energy Consulting Network commissioned in relation to UNDP's REDTAP project.
Preparing the Outer Islands Electrification Project. Feasibility Study, prepared by Samoan consultants. Vol. 4.2000, TA 3232-MLD:	2000		solar and wind Cost assessment	Report unseen, requested of MHE ADB could not locate.	Report by Samoan consultants commissioned in relation to ADB's Outer Island Electrification project.
Republic of Maldives: a plan for carbon neutrality	2009	Goodhall and Lynas paper	Wind, solar costing overview	Summary/ quick appraisal of potential cost of carbon neutral agenda.	<i>Guardian</i> , 16 March 2009
Remote Area Micro-Grid System using Diesel Driven Doubly Fed Induction Generators , Photovoltaics and Wind Generators	2007	Chem Nayar, <i>Senior Member, IEEE</i>	Micro-turbines	Uses Maldives as example. Technical paper re engine modifications and efficiencies of tying with RE	DLRE website (Daily Life Renewable Energy) is a consultancy with some RE/hybrid projects on-going in the Maldives.
			WIND		
Weather Monitoring Report	April 2008	XCo2 Energy	Wind	Includes analysis of the SMILES wind data for Eydhafushi.	Report by private consultants commissioned

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data from Vegetable Garden Weather Station between October 2006 and April 2008 and Eydhafushi Mast between July 2003 and January 2005					by Soneva Fushi, a 5* resort in Baa atoll in relation to their private carbon neutral project. [may not be publically available]
Title: Wind and Solar Resource Assessment of Sri Lanka and the Maldives (CD-ROM).	2003	Elliott, D.; Schwartz, M.; Scott, G.; Haymes, S.; Heimiller, D.; George, R.	Wind	CD contains an electronic version of Wind Energy Resource Atlas of Sri Lanka and the Maldives, GIS Data Viewer (software and data files with a readme file), and Hourly Solar and Typical Meteorological Year Data with a readme file.	(NREL/TP-500-34518) http://www.nrel.gov/wind/pdfs/34518.pdf
Wind Energy Resource Atlas of Sri Lanka and the Maldives	2003	Elliott, D.; Schwartz, M.; Scott, G.; Haymes, S.; Heimiller, D.; George, R. NREL	Wind	Dominant focus is on Sri Lanka. Key findings for Maldives discussed in Chapter 4	http://nrelpubs.nrel.gov/Webtop/ws/nich/www/public/ResultSet?upp=0&rpp=25&w=NATIVE%28%27KEYWORD2+ph+words+%27%27maldives%27%27%29&order=native%28%27pubyear%2FDescend%27%29
			SOLAR		
Solar Resource Assessment for Sri Lanka and the Maldives	2003	Dave Renné, Ray George, Bill Marion and Donna Heimiller (NREL) Chris Gueymard	Solar	<i>"The study shows that ample resources exist throughout the year for virtually all locations in Sri Lanka and the Maldives for PV applications, such as solar home systems and remote power applications. In the Maldives in particular, the high levels of solar resource throughout the entire country make it well suited for off-grid, island-based photovoltaic applications as an alternate to, or supplement to, diesel power generators. Because of the general high level of cloudiness and humidity associated with tropical settings such as this, the resources for concentrating solar power are generally less than adequate, except for certain times of the year."</i>	http://www.nrel.gov/docs/fy03osti/34645.pdf National Renewable Energy Laboratory NREL/TP-710-34645 Available electronically at http://www.osti.gov/bridge

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		(Solar Consulting Services)			
Design specifications of PV-diesel hybrid system for Mandhoo island	30 Jan 2005	SMILES	Solar	specifications for the PV part of the PV-diesel system, reported prior to implementation at Mandhoo island. Implemented as part of The SMILES project (“Strengthening Maldivian Initiatives for a Long-term Energy Strategy”).	SMILES partners: <ul style="list-style-type: none"> • GoM (MCST) (Ministry of Atolls) (MTCA). • ADEME (French govt Agency) • Utrecht university (UCE) • EXPLICIT (France), • STELCO Close cooperation with the UN RETDAP project.
Waste to Energy					
Maldives environmental Management project (MEMP) North Province RWMF Project. Best Practicable Environmental Option (BPEO) Report, Draft Final Report	March 2010	<i>Prepared by SENES Consultants Limited, Canada In Association with Commerce Development & Environment Pvt. Ltd, Maldives</i>		<p>“The Government of the Republic of Maldives is undertaking the Maldives Environmental Management Project (MEMP) to upgrade solid waste management in the North and North Central Province. The MEMP main objectives are to construct the Regional Waste Management Facility (RWMF) and the associated waste management and collection infrastructure in the various islands and atolls, and strengthen the capacity for environmental management in the Maldives at the island level. The MEMP has four (4) components which include:</p> <ul style="list-style-type: none"> ▪ Regional Solid Waste Management Program; ▪ Regional Environment Assessment; ▪ Environmental Capacity and Human Resource Initiative; and ▪ Project Management and Project Communications.” <p>Quotation from consultant working on MEMP: “MEMP project has a waste management component which constitutes approx. 50% of the loan fund. A Best Practice Environmental Option process has been completed. This is a consultative process involving national, provincial and island stakeholders. Waste to/ for energy was one</p>	Report to MHE. MEMP is a project running to 2014 funded by a \$13m World Bank Loan.

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				<p>of the core technology options presented, and climate change was a sub criteria under the environment pillar weighted and scored by the participants. Waste to/ for energy was not the preferred technology option selected for the overall waste management system. In the context of the project area and funds availability the decision not to proceed with a waste to/ for energy technology option in this case probably has quite strong foundation on balance. This does not necessarily preclude waste for energy to be considered further in this project provided that it can be introduced in a way which is consistent with the other elements of the system requirements as identified by the participants in the selection process. “</p> <p>Quote from Project Coordinator, Environmental Protection Agency, “Strategically there were some plans from Environmental Protection Agency to establish regional waste management facilities in 5 regions. However that is going to be a challenge because even establishing one engineered facilities will be of high cost. A feasibility was conducted to establish one in the South Ari (Alif Dhal) Atoll and it was estimated to cost about 6million dollars.”</p>	
<p>Scope Study on the Potential for Recycling of Waste Materials on Islands in South and North Ari Atolls</p>	Feb 2010	UNDP - UNOPS	Waste recycling	<p>“The work to date gives a solid basis of data into waste quantities and current waste management practices.</p> <p>As the study progressed it became clear that a recycling management plan and implementation strategy for North and South Ari Atolls was not an optimal outcome at this time. In the absence of a developed recycling system for the densely populated Male region, it is not practical to implement a recycling system for North and South Ari. With the SARWMP now in its completion phase, there is also no organisation with the resources to coordinate and implement a recycling plan for this region. In discussion with the EPA, it was agreed to expand the scope of the study to develop an action plan to improve recycling for the Maldives. North and South Ari remained as the focal point to inform the study based on the existing systems and needs of this area as an indication for the needs of</p>	<p>This study was initiated by UNOPS, UNDP and the South Ari Regional Waste Management Project (SARWMP) to specifically look at ways to facilitate increased recycling activities in North and South Ari Atolls. The study area was selected due to the ongoing work that has been undertaken in waste management in this region, particularly through the EU</p>

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				<p>the Maldives as a whole. The expanded focus has led to an action plan to enhance recycling opportunities throughout the Maldives. “</p> <p>Quote from Project Coordinator, Environmental Protection Agency, “In Thilafushi and Hulhumale some recycling activities are being carried out. In Thilafushi a private company operate a small factory where non PET plastics are used (recycled) to produce plastic bags. In Hulhumale' there is a small factory which recycle stereo-form to produce food container boxes. There are some groups who sell metal to Indian buyers.”</p>	and World Bank funded SARWMP.
Final report landfill gas (ECN 2004)	2004	Energy Consulting Network	Landfill gas		Report by Energy Consulting Network commissioned in relation to UNDP's REDTAP project.
Feasibility study: small scale waste To energy incineration Republic of Maldives	10 Dec 2007	IP India	Waste to Energy Landfill gas	<ul style="list-style-type: none"> Assesses Island waste management systems (5 islands as representative case studies). <ul style="list-style-type: none"> Why better/worse in different islands/ potential waste / Willingness to pay/ waste generated comparisons/ segregation issues “Daily collection appeared to be most effective in terms of ensuring that waste did not get dumped into the ocean, but an equally effective solution could be weekly collection with provision of area-wise or household wise collection bins. While the concept of segregation seems to be well understood, there is little or no segregation of waste in practice largely due to lack of proper facilities and incentives. Disposal practices , in general, were also inadequate, with waste being dumped at sites in an uncontrolled manner often close to vegetation lines or shorelines. Burning of waste was also being undertaken in an uncontrolled manner leading to hazardous emissions which are detrimental to human health.” “It is estimated that at least 91% of the waste generated constitutes burnable waste that can form the input to potential waste to energy solutions.” Quantities of waste generated across the islands surveyed were 	Submitted to MEEW. Financed by UNDP

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				<p>found to be inadequate to support potential WtoE solutions thus clustering of islands needed to support waste solutions at levels of 50/20/10 tones p.day.</p> <ul style="list-style-type: none"> • WtoE solutions for electricity; conversion to Syngas or charcoal (pellets) (for cooking); use of heat for potable water, and use of ash, the combustion by-product, to produce concrete. • Assesses the current energy systems. Inefficiencies/ cost/KWh • Proposed waste to energy solutions (technical options and justifications + specifications (combustion, gasification, plasma, pyrolysis, incineration...) • Financial modelling of proposals + CBA <ul style="list-style-type: none"> • Combustion based solutions proposed to produce electricity and desalinated water for large clusters (50TPD) and for desalinated water alone for medium cluster (20TPD). Adequate returns to provide a positive net present value even under worst case scenarios and also showed a net economic benefit in comparison to simple incinerator solutions. A scenario analysis, taking into consideration variation in growth of waste, number of days of operation of facility, debt-equity mix, shows the project to be beneficial even under the worst case. • WtoE solutions are feasible from a technical, financial and economic perspective only in cases where the waste streams exceed 15 TPD. In all other cases, a simple incineration of the waste may be the best possible option. • Recommended policy and technology solutions – including pilot 	
Solid Waste Management Project Information Memorandum	April 14, 2010	IFC, GOM. A&O, ENE	Waste management	IM re competitive tender for a Public Private Partnership (“PPP”) for developing and implementing an integrated municipal waste management system for 3 identified catchments in the Maldives namely <i>Thilafushi</i> (Malé and its surroundings), <i>Hithadhoo</i> (south) and <i>Kulhudhuffushi</i> (north) including collection, storage, transportation, segregation, treatment and disposal of waste..	
			Bio-fuels		
Biomass survey,	2004	Energy	Bio-mass –		Report by Energy

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technical report		Consulting Network	household waste		Consulting Network commissioned in relation to UNDP's REDTAP project.
Feasibility study on farming, processing and export of Eucheuma (seaweeds) Laamu Atoll, Maldives. (Based on the work of Ruben Barraca, Sr. Seaweed Culture Specialist)	1996	Food And Agriculture Organization of the United Nations, Bangkok	Seaweed for biogas	Reporting on three attempts in the past to cultivate seaweed in the Maldives – in 1987, 1995, 1996 – all which don't seem to have succeeded . They all have attempted to cultivate the seaweed species Eucheuma cottoni which has many applications, particularly in the food industry.	TCP/MDV/4452Field Document 2
Not a report but ongoing research	2010	Dr Ranjith De Silva and Suran Goonatilake plus researchers at University College London (UCL), University of Philippines, and IUCN (International Union for the Conservation of Nature)	Seaweed for biogas	Investigating the potential of using Seaweed in the Maldives for biogas generation via anaerobic digestion and electricity generation using gasification	(www.iucn.org) Suran Goonatilake [s.goonatilake@cs.ucl.ac.uk]
			WAVE		
Marine currents study - Robert Gordon university	2009	Marine Currents	Wave	Report unseen	<i>Dr Alan Owen Director, Centre for Understanding Sustainable Practice</i>

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					<i>The Robert Gordon University, Schoolhill, Aberdeen, AB10 1FR T: (+44) 01224 262360 M: (+44) 07837 659167 www.rgu.ac.uk</i>
			Current diesel-based energy system		
SARI/Energy Maldives Submarine Cable Interconnection Pre-feasibility Study	March 2010	SARI Work believed to be commissioned by STELCO	Energy transmission	The study consists of determining the pre-feasibility of interconnecting the different islands using submarine cable, particularly: • Development of a Supply/Demand Forecast and Capacity Development Plan • Techno-economic Evaluation of Interconnection Options • Environmental Impact Considerations The incorporation of the Carbon-Neutral Plan is described in a separate report (unseen)	Report No. 020613-40RP-0001 Private (believed to be unpublished report provided to the author by STELCO)
'Technical Report: Energy Supply and demand. Assessment of Least-cost, Sustainable Energy Resources, Maldives.'	2003	Stobbe, Morten and Andersen, Nick of Energy Consulting Network	Demand focus.		Report by Energy Consulting Network commissioned in relation to UNDP's REDTAP project. Project INT/99/R11-02 MDV 1180.
Maldives energy balances and indicators 2003 - 2005	2006		Fossil fuel use / carbon assessment	Goal of this phase 2: i) developing an energy statistics system and ii) strengthening the capacity of the Maldivian ministerial energy administration (then the Ministry of Environment, Water and Energy) to monitor the development in the national energy consumption and improve the quality and reliability of national energy balances. This included: - Organisation of data acquisition and establishment and refinement of tools for handling energy data; - Generation of national energy balances and energy statistical energy indicators; - Development and implementation of a methodology for generation of	Report by Energy Consulting Network commissioned in relation to UNDP's REDTAP project.

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				future energy balances	
Overcoming vulnerability to rising oil prices Options for Asia and the Pacific Regional	2007	UNDP	Diesel generation impacts	Ranks Maldives as most vulnerable country in Asia in terms of vulnerability to oil price spikes.	
ADB's Outer islands electrification (sector) project "Report and recommendation Of the President To the Board of directors on a Proposed loan to the Republic of Maldives For the Outer islands electrification (sector) project"	Nov 2001	ASIAN DEVELOPMENT BANK	Electrification – diesel based as RETs assessed uneconomic	The Project will improve electricity supply in about 40 outer islands on a sustainable and affordable basis, and thus promote local economic development, improve the standards of living in the outer islands, and reduce the poverty and vulnerability of the outer island populations. The Project will also build the capacity of sector institutions as well as strengthen the legal framework for the devolution of responsibilities to the outer island power supply utilities. \$8m ADB loan to fund it. 1.5% interest rate. 32year loan. <ul style="list-style-type: none"> - Assesses energy system. Players/ demand/ growth/structures/tariffs/ key sector issues/ policy dialogue. - Implementation strategy and approach/ agencies involved - Environmental and social matters - Project justification (financial, social, risks) - 100% diesel systems installed as Samoan consultants assessed RE as uneconomic. - Project now closed though 2 islands still to complete (underway) 	RRP:MLD 32036
			ENERGY POLICY		
Final draft national energy policy (Aldover 2006)	2006	The Government of Maldives	Energy policy	Unseen – old draft worked on under REDTAP project.	RETDAP
THE STRATEGIC ACTION PLAN	2009	The Government	Energy policy	Details the Government's 5 key priority areas, including energy reform plans	Presidents' office website

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National Framework for Development 2009 - 2013		of Maldives			
(draft) national energy policy	2010		Energy policy	Draft being finalised under consultation and review process, summer 2010. Identifies and gives brief agendas on 6 key energy strategies. 1) Affordable and reliable supply of electricity 2) Carbon neutrality by Year 2020 3) Energy conservation and energy efficiency 4) Energy security by diversifying energy sources 5) Promote Renewable Energy Technologies 6) Strengthen the institutional and legal framework of the energy sector	MHE website
Energy and poverty In the Maldives. Challenges and the Way forward	2007	UNDP	Energy policy assessment	Focus on energy affordability as well as many systemic inefficiencies. Includes many policy recommendations	
Invest Maldives – Investment Opportunities in Utilities Sector	2010	RoM	Energy system – privatising supply	Electricity, Water, sanitation utilities. Growth projections. Expected sales. Basic energy details about atolls. KWh etc. useful graphs (come from MHE).	
Maldives state of the environment report Part 2 - overview of major Environmental Developments And trends	2002	UNEP	Overview of energy system and other environmental issues	Analysis not high resolution	
Building Capacity and Mainstreaming Sustainable Land Management in Maldives	28 Sept2007		Land management , agriculture, water conservation	Abstract: “The expansion of housing and intensification of land use have led to over extraction of groundwater and contamination of aquifers by poor sewerage and improper waste disposal practices. In the inhabited and uninhabited islands, where agriculture is intensive, land productivity is declining due to continuous cropping with shorter fallow periods. In these islands, the risk of groundwater depletion and contamination by fertilizers	UNDP, GEF, Government of Maldives anna.tengberg@undp.org

LIST OF RELEVANT REPORTS AND STUDIES

				<p>and pesticides is very high. Consequently, sustainable land management (SLM) is one of the Government's top priorities.</p> <p>The objective of the project is to build capacity in SLM in appropriate government institutions and communities and mainstream SLM into government policy, planning and strategy development. The project has four outcomes:</p> <p>(1) Strengthening human & institutional capacities on SLM; (2) Developing capacity in knowledge management; (3) Mainstreaming SLM into national development plans and sector policies; and (4) Completion of a National Action Programme to combat desertification.</p> <p>- 3 year project from August 2007. - Executed by the then Ministry of Housing and Urban Development (MHUD). - Budget: US\$ 985,000 (of which US\$475,000 from GEF).</p>	
Developing a Disaster Risk Profile for Maldives	May 2006	UNDP	Wind resource – storm hazards	<p>This study provides a comprehensive risk analysis of Maldives with description of various hazards, vulnerabilities and potential damage and loss scenarios. The analysis provides the most complete hazard mapping exercise of the country till date and it is based on geographical evidence, historical data and projections of future hazards. It likewise assesses the complete range of vulnerabilities to multiple hazard events, which will inform coping and adaptive strategies for communities at risk.</p> <p>Describes wind speeds but in relation to storm hazards</p>	

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I. BACKGROUND

The Government of Maldives (GOM) has pledged to be carbon neutral by 2020 while enhancing greater energy security and reaping economic, social and environmental benefits. Towards achieving this goal, the Ministry of Housing and Environment (MHE) formulated the Maldives National Energy Policy & Strategy in October 2010 to “Provide all citizens with access to reliable and sustainable energy services at lowest possible cost”; “Achieve carbon neutrality in the energy sector by year 2020”; “Promote energy conservation and energy efficiency” and “Increase national energy security”. Energy security is a key concern as the country spent 15% of GDP on fossil fuel imports in 2009.

They have begun a number of initiatives, including a carbon audit⁶, and are preparing a road map for attaining carbon neutrality and a framework for clean energy investments on the basis of previously conducted studies and reports available in the Maldives. A number of donors are supporting the GOM in their efforts.

Table 1 Fuel Use in the Maldives 2009 (BeCitizen op cit.)

Fuel	Quantity
Diesel - imports incl. bunkering	280,256 t
Diesel - bunkering	3,952 t
Petrol - imports	28,322 t
LPG - imports	11,537 t
Jet kerosene - imports excl. bunkering	25,495 t
Jet kerosene - bunkering	142,168,798 L
Kerosene - imports	935,91 t
Lubricating oil - imports	2,543,329 L

400 kWh/inhabitant (excluding resorts). In the consumption by utility is given in Figure 1.⁷ Per capita electricity consumption is relatively uniform except in a few islands due to high industrial activity, higher living standard and economic activity, and higher housing energy consuming in islands affected by the tsunami in 2004. These high energy consuming islands include Male’ Greater Area, Vaikaradhoo, Kudarikilu, Himmafushi, and Vilufushi. Energy intensity is high on resort islands, averaging 4,460 kg of diesel per bed with energy used for air conditioning (~40 %), freezing (~10 %), desalination (~10 %), lighting (~10 %), and laundry (5-20 %).

Maldives Energy Sector. Fossil fuels, primarily petroleum provide the majority of energy used in the Maldives for generation of electricity (diesel), road and marine transport (gasoline, diesel), aviation (jet kerosene), and cooking, hot water and other uses (LPG, kerosene) (see Table 1).

Renewable energy use is minimal beyond solar hot water heating in resort islands. In 2009, average electricity consumption in the inhabited islands was Male’ region, it was 1,678 kWh/inhabitant. Electricity

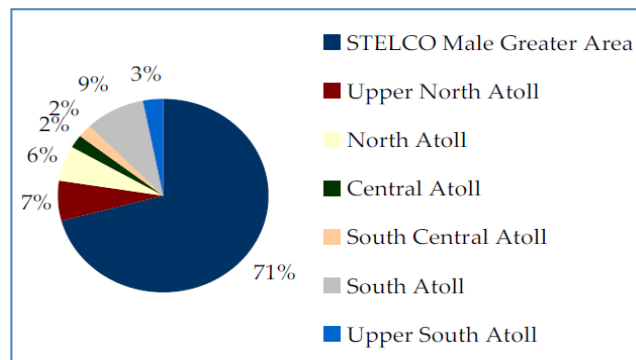


Figure 1 Electricity Consumption by Utility (BeCitizen op. cit)

Sector organizations. Roles and responsibilities – President’s Office of the Maldives, MHE, Maldives Energy Authority (MEA), State Electric Company Limited (STELCO) and regional utilities, Maldives National Oil Company.

⁶ BeCitizen, *Maldives’s 2009 Carbon Audit* prepared for the President’s Office of the Maldives and the Ministry of Housing and Environment, November 2010.

⁷ This data is from Maldives’s 2009 Carbon Audit.

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Renewable energy and energy efficiency. A number of renewable energy (mainly solar and wind) projects have been undertaken by the utilities and others (see Figure 2 and Kersteron⁸). Solar hot water heating is used extensively on resort islands, reportedly providing about 50% of their hot water requirements. An Indian company, BBM Infra Ltd., has signed a PPA to supply electricity from 24 MWp of solar PV systems installed in Gaafu Dhaalu Atoll. A Finnish company, WinWind, has proposed building a 25 MW wind farm on the Maldives' Gaaf Alif atoll, while Indian wind turbine maker Suzlon is investigating the feasibility of constructing a 15 MW wind farm on the Addu atoll. Japan has provided financial assistance for a project to install 1 MW of rooftop solar arrays on schools and government buildings in Malé, the country's capital.⁹ There are also projects in the following sectors:¹⁰

- Renewable Energy Maldives Ltd. (REM) is currently working on: A PV-powered dive vessel, and electric motors for solar and diesel powered dhonis.
- REM has installed a demonstration plant of heat absorption chiller in Emboodhoo.
- The Male Water and Sewerage Company (MWSC) has developed energy recovery systems for new desalination plants. Such systems provide 50 % energy savings.
- The International Finance Corporation (IFC) is supporting a waste management project to support a Public Private Partnership (PPP) with an international contractor company. The Waste Management Corporation Ltd. (WMC) is seeking an incineration solution. The company expects that from 2011, all waste dumped in Thilafushi will be incinerated. The company is also looking at other locations to build smaller incinerators (1 MW of electricity) in Addu and Kulhudhufushi and will launch awareness programs.

A framework for clean energy investments in the Maldives was prepared recently with technical support from the Asian Development Bank (ADB). "Clean energy" encompasses renewable energy and energy efficiency. The document was completed based on reviewing previously conducted studies, other reports and readily available information. It includes an overview of the energy sector in the Maldives and greenhouse gas (GHG) emissions, the role for renewable energy technologies in the Maldives and barriers to its development, provides recommendations on planning, regulation, institutional requirements and detailed studies to be undertaken in order to develop a complete an investment plan for the energy sector.

The ADB and the World Bank Group (WBG) managed multi-donor Scaling-Up Renewable Energy Programs (SREP) facility has committed up to US\$ 30 million in grant or highly concessional loan financing to the Maldives. SREP supports investment, policy support and capacity building in low income developing countries to stimulate economic growth through the scaled-up development of renewable energy solutions. It will catalyze the transformation of the renewable energy markets by obtaining government support for market creation, private sector implementation, and productive energy use. SREP promotes both public and private sector actions to remove barriers that might otherwise inhibit scaled-up private sector investments. SREP with require 3 to 4 times in additional co-financing (other donors, government, private sector etc). Such additional financing would

⁸ Lara Kesterton, *An investigation into the policies, technologies and economics of achieving clean electricity in a small island in the Maldives*, Appendix C, Thesis, MSc Environmental Change and Management, Oxford University, September, 2010

⁹ Renewable Energy and energy efficiency Partnership, Maldives Database Details, <http://www.reeep.org/index.php?id=9353&text=policy&special=viewitem&cid=45>

¹⁰ BeCitizen op. cit.

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contribute to the GoM goal of achieving carbon neutrality with complementary investments in energy efficiency, renewable energy, policy and capacity building.

In addition, GOM is receiving support from the World Bank-managed multi-donor Climate Change Trust Fund (CCTF) to deal with adaptation and mitigation of climate change. The CCTF is a multi-donor program established on December 29, 2010 with the EU supporting the program to the amount of EUR 6,500,000 over a period of 3 and 1/2 years. A Memorandum of Understanding was signed on April 6, 2010 between the Government, EU and the World Bank. On June 4, 2010, the World Bank signed the second Administration Agreement (AA) for the trust fund (TF) with AusAID as the second donor. AusAID has provided a contribution of AUS 0.5 million. The CCTF will support the development and implementation of the climate change strategy for Maldives to build a climate resilient economy and society through adaptation and mitigation activities.

II. GOAL AND OBJECTIVES OF THE ASSIGNMENT

The goal of the assignment is to prepare a clean energy investment plan for the first five years that would help the Maldives move toward achieving its 2020 carbon neutrality pledge. A portion of the five year time slice of investments and capacity building would be financed in part with approximately US\$120 million in funds committed by SREP (up to US\$30 million) and other co-financiers. While SREP will finance renewable energy investments and associated technical assistance, other co-financiers may finance both energy efficiency and renewable energy investments and additional technical assistance.

The overall objectives of this assignment are to: (i) review the framework for clean energy investments recently completed on the basis of previously conducted studies and reports available in the Maldives; (ii) gather additional information and data required to complete the clean energy sector investment plan; and (iii) prepare the clean energy investment plan according to the requirements and guidelines provided by MHE.

The focus of this assignment is on electricity production and electricity-using sectors along with some thermal applications such as desalination and air conditioning. Clean energy investment plans for transport, cooking, and process heat will be prepared separately.

The clean energy investment plan will limit its recommendations to the inhabited islands. Associated technical assistance for services such as policy and regulations formulation, resource monitoring and capacity building should be specified. Recommendations for the resort islands will focus on policy and regulations, resource monitoring support, and capacity building. Recommendation will also be made for demonstration projects that could be implemented by the resort owners to gain experience and confidence on renewable energy and efficiency measures.

III. TASKS OF THE CONSULTANT

The tasks to be undertaken by the Consultant under this outlined Terms of Reference include, but are not necessarily limited to, the following:

1. **Inception**. The Consultant will review the framework for clean energy investment in the Maldives and other available information. The review will identify the principal clean energy opportunities and their characteristics (cost, performance, resource and other requirements, extent of applicability across island types etc.) and experiences to-date with renewable energy

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and energy efficiency projects. The Consultant will also identify and characterize the major policy and regulatory requirements and other technical assistance services identified in prior studies. The Consultant will meet with private sector and utility entities to assess their experiences and obtain their feedback on the proposed study and approach. The Consultant will reach agreement with the MHE on the detailed approach and schedule, the scope of coverage, the key issues to be addressed, confirm the principal outputs and agree on arrangements for obtaining data and support from MHE, MEA, STELCO, regional utilities, Maldives Metrological Services (MMS), and other counterparts.

2. **Island Classification and Characterization.** The Consultant will establish a typology for grouping islands with similar energy (and resource) characteristics so that renewable energy and energy efficiency solutions could be determine for such classifications. The data required for such classification may include:
 - a. *Electricity demand and demand growth.* MHE has requested STELCO and regional utilities to compile electricity data for the islands they are serving as well as from islands that are yet served by community owned and operated utilities. The data will be provided electronically in EXCEL where available or in hard copy. Data that is readily available include energy production and sales, fuel and lubricating oil consumption, delivered fuel costs, daily load curves, number of customers by type and average consumption, number and rating of generators, firm plans for capacity additions and types of generators to be added. The utilities will provide information on the number, capacity and operating characteristics of captive generators on the islands such as at hotels, fish processing or ice making plants; suppressed demand; near term loads to be added and impact on the electricity supply requirements. If additional information is needed, the Consultant will be responsible for designing the data collection methodology including survey questionnaires, conducting sample surveys/focus groups and data analysis. The Consultant will be responsible for collecting data from resort islands. MHE could facilitate the Consultant gaining access to resort management.
 - b. *Utility financial information and tariffs.* MEA and MHE may assist, as needed, with obtaining information from the utilities on cost of supply, utility balance sheet, profit and loss, long term liabilities, employees as well as tariffs and subsidies.
 - c. *Specific load data.* The Consultant will need to gather information on applications such as desalination, hot water and air conditioning which could be provided by renewable thermal energy.
 - d. *Other data.* The MHE will facilitate the Consultant obtaining other information needed to classify and characterize the islands including industrial activity, population, government services, other major end-uses such as ice making or fish processing, desalination or harbors and development plans.
 - e. *Renewable resource data.* The MHE will facilitate obtaining available data from MMS or other domestic sources. The Consultant will be responsible for obtaining data from international sources. Among the renewable sources to be considered are:
 - o Solar and wind modeled for each island (National Renewable Energy Laboratory (NREL) and National Aeronautics and Space Administration (NASA) Surface Meteorology and Solar Energy, hydromet, specific monitoring by MMS)

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- Waste (for large islands tons of solid waste and composition, sewage) and how it is currently disposed
- Waste heat (calculated potential from generation stations)
- Ocean thermal and marine current data

Based on this and other information, the Consultant will develop the typology and classify the islands into the grouping. Preferably about five or less categories will be defined, including Male' Greater Area, and resorts. The factors used for classification might include: island sizes or energy intensities, provincial/atoll capitals, industrial/government activity, or location. Prior to characterizing the islands, the Consultant will obtain No Objection from MHE for the proposed typology.

3. **Typical Island Profiles.** For the categories of islands, the Consultant will prepare energy and end-use profiles that will assist in identifying energy efficiency and renewable energy options that are viable for each island grouping. The energy profiles will include, among others the following:
 - a. Electricity consumption patterns by consumer group, consumption by major end-uses (lighting, air conditioning, refrigeration, entertainment, industry (ice making, other), communications, etc.
 - b. Load profiles
 - c. Generation characteristics
 - d. Electricity cost
 - e. Renewable energy use and potentials
 - f. Energy efficiencies
4. **Load forecast.** Based on this information, the Consultant will forecast the base case load and load growth for the next 10 and 20 years for each of the islands groupings and for the nation.
5. **Supply curve analysis.** The Consultant will conduct financial and economic analysis to assess the financial/economic cost (Rf/kWh) as a function of renewable energy MW added or energy efficiency MW avoided/reduced, and CO₂ emissions avoided for the grouping of islands and for the nation as a whole. Examples of such curves are those prepared by McKinsey¹¹ or Meier¹². The options to be considered are: energy efficiency (load management, energy saving, waste heat recovery); renewable electricity (small and large wind, solar (roof top, ground-mounted large arrays, concentrated or tracking), ocean thermal/current/tidal, hybrids, waste to energy using bio-digestion or thermal processes, renewable energy- or waste heat recovery-based desalination or icemaking, solar hot water heating). Renewable fuels (municipal solid waste, sewage, bio-diesel, woody biomass, torrefied biomass (bio-coal) will also be considered for power generation. The analysis must take into consideration the period of commercial availability technologies that are yet in R&D or demonstration stages. The Consultant will undertake uncertainty analysis using software such as Oracle Crystal Ball¹³, to assess the robustness of the supply curve to key uncertainties such as fuel prices, resource uncertainties and demand uncertainties.

¹¹ http://www.epa.gov/oar/caaac/coaltech/2007_05_mckinsey.pdf

¹² http://www.sener.gob.mx/res/0/Presentacion3_Peter_Meier.pdf

¹³ <http://www.oracle.com/us/products/middleware/bus-int/crystalball/index.html>

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The Consultant will explore opportunities in integrating nearby resorts into local grid in order to achieve economies of scale and hence cost reduction.

6. **Investment strategy.** Based on the supply curve analysis the Consultant will recommend the five year investment plan that will comprise of energy efficiency measures and renewable energy investments. The types of projects, location of projects, the scale of projects (in terms of MWs of capacity as well as cost), timing of investments, lead investors (public or private) will be described. For the investment plan, the Consultant will estimate MW and MWh contributed/avoided, extent to which CO₂ emissions are reduced and the total and incremental financial and economic cost of the clean energy investments.
- The Consultant will present risk analysis of the proposed investment plans focusing on institutional, technology, environmental, social, financial and implementation risks.
 - The Consultant will suggest public and private sector energy delivery investment/business approaches, propose financing instruments/subsidies and specify institutional, policy and regulatory framework required for implementation and reduction of risks.
 - The Consultant will specify requirements and estimate the cost of capacity building; renewable resource monitoring; information/outreach; policy, legislation and regulation development; and implementation support required for undertaking the five year investment plan.
 - The Consultant will present these findings of Tasks 6 to the MHE and other stakeholders and agree on the priority investments to be included in the five year investment plan. For these priority SREP and other co-financed investments, the Consultant will prepare a preliminary investment cost estimate, including potential sources of such financing.
7. **Environmental and Social Management Framework (ESMF).** An ESMF will be prepared by the Consultant for the priority investments agreed to be supported during the five year timeframe. The Consultant will conduct an environmental and social impact assessment (ESIA) of these investments, identify potential environmental and social impacts associated with such investments and recommend an ESMF to ensure that environmental and social issues are effectively addressed in project design and implementation. GOM, ADB and World Bank requirements must be met. This task will formulate the ESMF that sets out the safeguard policies and procedures for the project complying with the safeguard policies of the GOM, ADB and World Bank. The ESMF shall be comprised of: (i) a detailed approach to carry out screening and scoping exercise to identify environmental and social issues; (ii) categorization of investments; (iii) outline of methodology to carry out ESIA's; (iv) guidance on securing various environmental clearances for the investments; (v) systems, policies and procedures for environmental and social management during operation and maintenance including health and safety aspects; (vi) review of relevant policies and Acts, (vii) entitlement frameworks for social management and resettlement including tentative budget format and unit rates; (viii) monitoring and evaluation indicators and mechanism; (ix) institutional arrangements for implementation of ESMF; (xi) consultation strategy and Information

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package for dissemination; and (xii) budget; training and capacity building requirements for the implementation and operationalisation of the ESMF.

8. **SREP Investment Plan**. The Consultant will prepare SREP investment plan following the outline presented in the Annex 1 or suggest an alternative for approval by MHE.

IV. DELIVERABLES

The deliverables and indicative time schedule is as follows:

- A. ***Inception Brief (Task 1)***: the inception brief shall be submitted no later than two (2) weeks after the commencement of the assignment and shall include summary of reviews and assessments undertaken and scheduled. The inception brief shall also identify any constraints the Consultant foresees with delivering the services and propose actions to be implemented to overcome the constraints identified. The responsibilities of parties and agreed deliverables, including workshops and the schedule will be given.
- B. ***Report I for Tasks 2 to 5***: the interim report shall be submitted no later than ten (10) weeks after the commencement of the assignment and shall include:
- Typology and classification of islands
 - Characterization islands and island groupings
 - Load forecast
 - Supply curves

The Consultant will issue the report and present the findings at a meeting hosted by MHE.

- C. ***Report II for Task 6 – Draft Investment Plan***: Due sixteen (16) weeks after commencement of the assignment. The draft investment plan will take into consideration the feedback received from MHE. Report II will present the following:
- Description of the priority investments to be undertaken
 - Detailed economic and financial feasibility and cost benefit analysis, and co-benefits assessment for priority investments
 - Institutional arrangements, role of private and public sectors, policy and regulatory framework required for implementation.
 - Proposed technical assistance needed to support the implementation.
 - Estimated cost of investments and technical assistance showing sources and uses and funds and the timing.
 - Schedule
- D. ***Workshop***. The Consultant will present these findings at a workshop organized by MHE. The Workshop is scheduled for seventeen (17) weeks after commencement of the assignment. Subsequent to the workshop the Consultant will reach agreement on the priority investments, implementation approaches, roles of public and private sectors, investment requirements and technical assistance requirements to be included in the five-year investment plan.
- E. ***Report III for Environmental and Social Management Framework (Task 7)***: The Consultant will issue the ESMF for the priority investments within nineteen (19) weeks of commencement of the assignment.

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- F. **Report IV SREP Investment Plan (Task 8):** the Draft SREP Investment Plan shall be submitted no later than twenty-two (22) weeks after the commencement of the assignment. The report will use the outline proposed in Annex 1 or an alternate agreed with MHE. The final SREP Investment Plan is due twenty-four (24) weeks after commencement of the assignment.
- G. **Workshop.** The Consultant will present the SREP Investment Plan at a Stakeholder Consultation hosted by MHE. The Workshop is due twenty-two (22) weeks after commencement of the assignment.

V. QUALIFICATION AND EXPERIENCE OF KEY PERSONNEL

The Consultant will field a team of experts with the requisite skills and qualifications noted below. One expert may be proposed for one or more positions and several experts may be proposed for one position. The Key Personnel are the following:

Project Manager with at least 15 years of experience in managing energy and power planning studies, including renewable energy and energy efficiency integration. Demonstrated experience in working with utilities and energy ministries, and effectively managing multi-expert teams is required. Developing country experience, especially in small power systems/islands would be necessary. An advanced degree in engineering, power planning, business, or economics/finance is required.

Power Systems Planner with at least 10 years experience in power systems planning, use of appropriate planning software for grid of small capacities that are capable of evaluating renewable energy and efficiency options. Developing country experience would be very valuable. An advanced degree in engineering, finance, economics or power planning is required.

Environmental and Social Impacts Assessment Specialists with at least 10 years of experience in assessing environmental and social impacts and designing mitigation measures for renewable energy, energy efficiency and power systems. Experience with ADB, World Bank ESMF development is essential. An advanced degree in environmental planning/policy or other appropriate discipline in needed.

Utility Economist and Financial Analyst with 10 years of experience in utility economics and financial analysis, including supply curve derivation, risk assessment, assessing global environmental and other externalities. An advanced degree in economics or finance is required.

Renewable Energy and Energy Efficiency Specialists with at least 10 years investment project experience in solar PV, wind, biomass/biofuels, especially bio-digestion of municipal solid waste (MSW) and sewage demand-side management, energy efficiency, and knowledgeable about other renewable energy technologies such as ocean energy. Renewable resource assessment and evaluation experience is also needed. An advanced engineering degree is necessary.

Policy and Legal Specialist with at least 10 years experience in Maldives contract law, legal requirements and regulation for investment and management services contracting.

All staff must possess excellent interpersonal skills and demonstrated ability to work in a team environment as well as independently both in office and field environments. They must also be fluent

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in written and spoken English and possess the capacity to travel to islands in demanding weather conditions.

VI. REPORTING

The Ministry of Housing and Environment is the implementing agency for the Climate Change Trust Fund and the Climate Change and Energy Department has overall responsibility for the management of the contract and contractual reporting obligations for all consultancy assignments. The Maldives Energy Authority (MEA) is mandated as the regulatory body for developing policies and ensuring implementation of the policies. The Consultant is, expected to report to MHE and work closely with the MEA counterpart and will report directly to the Permanent Secretary or his designate during the course of the assignment.

All reports and documents will be submitted in English in two (2) hard copy and soft copy on one (1) CD. All reports and documents will be submitted in draft to the Ministry of Housing and Environment (MHE). The client will review the reports and documents and provide comments to the Consultant within two (2) weeks of receipt. The Consultant will address the Client's comments and submit as a Final Report before the end of the assignment.

VII. FACILITIES TO BE PROVIDED BY THE CLIENT

- MHE will provide the Consultant with office space and the necessary office facilities. They will also assign a counterpart to assist the Consultant, additional local staffs required to undertake the baseline survey, provide local transportation (inter-atoll/island) and surveying equipment as required during the course of the assignment.
- The MHE will ensure that access to electricity sector, renewable resource and other data that are identified in the various tasks will be provided to the Consultant in a timely manner (within 3 weeks of contract award or when request is made). Delays in submission of this data will extend the due dates for key deliverables accordingly.
- MHE will obtain, at no cost to the Consultant, multiple entry business visas for the period of the placement for the Consultant's team. MHE shall facilitate meeting with the National Planning Council to brief them on the planned developments and recommendations in implementing the Investment Plan. The Project Management Unit (PMU) and MHE will coordinate closely with the Consultant during the process.

VIII. CONTRACT DURATION

The successful candidate is expected to be available to commence the assignment in **April 2011**. The estimated contract duration will be for twenty-four (24) weeks (assuming there are no delays in the receipt of information and comments/feedback on reports submitted to the MHE and other counterparts). Subject to negotiation and budget, some of the services may be provided from the Consultants' home country and report deliverables through electronic communication.

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Annex 1 Suggested Structure of Investment Plan

I. Executive Summary (2 pages)

- Objectives
- Expected outcomes
- Program criteria, priorities and budget

II. Country Context (3-4 pages)

- Energy sector description (market structure, demand supply, and dispatch composition,
- Electricity cost and pricing) incl. renewable energy status
- Gap/barrier analysis; needs assessment

III. Renewable Energy Sector Context (3-4 pages)

- Government plans or strategy for the sector
- Analysis of RE and EE options (technology, cost, mitigation potential, barriers)
- Supply cost curve
- Investments, existing or envisioned policy, regulation, plans, and resource allocation
- Institutional structure and capacity (technical, operational, financial, equipment supply, information)
- Role of private sector and leverage of resources
- Ongoing/planned investment by other development partners

IV. Contribution to National Energy Roadmap (2 pages)

- Likely development impacts and co-benefits of SREP investments
- How SREP investments will initiate a process leading towards transformational low carbon growth

V. SREP Program Description (6-8 pages)

- Technology deployment investments
- Parallel activities to be funded by other development partners
- Capacity building and advisory services
- Environmental and Social Management Framework overview
- Investment preparation activities
- Environmental, social and gender co-benefits

VI. Financing Plan and Instruments (3-4 pages)

- Budget envelop for investments
- Costs and sources of funding
- SREP assistance (grant, concessional debt, etc.)
- Recipients of funding

VII. Additional Development Activities (2-3 pages)

- Leverage complementary co-financing with other development partners such as bilaterals, private sector, and financial institutions

VIII. Implementation Potential with Risk Assessment (2 pages)

- Country/regional risks - institutional, technology, environmental, social, financial

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- Absorptive capacity for SREP and leveraged resources

IX. Monitoring and Evaluation (1/2 page)

- Results framework table

X. Annexes

A. SREP Application:

- Problem statement (1-2 paragraphs)
- Proposed contribution to initiating transformation (1-2 paragraphs)
- Implementation readiness (1-2 paragraphs)
- Rationale for SREP financing (1-2 paragraphs)
- Results indicators
- Financing plan
- Project preparation timetable
- Requests, if any, for investment preparation funding

B. Environment and Social Management Framework

C. Other Annexes:

- Assessment of country's absorptive capacity
- Stakeholder consultations
- Co benefits
- Existing activities in the field of renewable energy, particularly activities of other development partners

SREP SCOPING MISSION PRESENTATION

**Maldives:
Scaling Up Renewable Energy Program
(SREP)**


January 24, 2011

Scaling Up Renewable Energy Program in Low Income Countries(SREP)

Purpose —
To pilot and demonstrate the economic, social and environmental viability of low carbon development pathways in the energy sector by creating new economic opportunities and increasing energy access through the use of renewable energy

Scale —
\$310 million in pledges for significant programs of capacity building and investments in renewable energy

Governance —
Sub-Committee: Armenia, Bangladesh, Japan, Netherlands, Nicaragua, Norway, Solomon Islands, Switzerland, Tanzania, United Kingdom, United States, Yemen + observers (4 civil society, 2 Indigenous Peoples, 2 private sector), Energy for the Poor Initiative, GEF, UNDP, UNEP, UNFCCC



Measuring Success

- Remove barriers to renewable energy investments
- Lead to replication of renewable energy capacity in a country's energy supply

2

SREP Operating Principles

- About \$300 million to finance 6 pilot countries
- Blending and leveraging with financing available from the MDBs and bilateral agencies/banks, other public and private sector resources
- Engaging private sector is an important aspect for achieving sustainability
- Complementary technical assistance
- Funds to be provided on a grant basis or IDA terms (private sector can also be recipient of concessional funds)

3

SREP Pilot Countries

Initial six countries and allocations

- **Maldives:** \$ 30 million
- Honduras: \$ 30 million
- Mali: \$ 40 million
- Nepal: \$ 40 million
- Ethiopia: \$ 50 million
- Kenya: \$ 50 million

- Additional \$ 60 million available in reserve
- Quality of proposed activities within the IP and speed of preparation / implementation will be a factor in the allocation of the reserve fund.
- 1:4 leveraging ratio is expected

4

SREP Next Steps

Phase 1: Development of an Investment Plan (IP) and Pre-Investment Support

- Scoping Mission planned from January 24-27, 2011 to initiate preparation of IPs; Joint WBG/ ADB team to work with GoM task force on developing the IP and other Phase I and II activities
- Coordination with partners and other stakeholders is critical
- Up to \$1.5M available for preparation of IP and capacity building (\$375,000 is available as an advance)

5

SREP Next Steps (cont'd)

Phase 2: Implementation of the IP

- Investments in new and proven renewable energy technologies
- Capacity building and advisory services activities are likely to be required to support implementation
- Knowledge management component

6

SREP SCOPING MISSION PRESENTATION

Key Elements of IP

- Country context (sector description, needs assessment, barrier analysis)
- RE sector context (Gov plans, ongoing activities, analysis of options, institutional structure and capacity)
- Proposed program description (justification of specific investments, technical assistance requirements)
- Co-financing, leveraging, partnership
- Primary and co-benefits
- Transformational impact
- Budget envelop, recipients, implementation arrangements
- Risk assessment
- Monitoring and Evaluation
- Investment concept brief for each IP component

7

IP Preparation Steps

- **Demand assessment**
 - Load and load growth (by consumption category and major uses) for electricity and fuels
 - Cost of service
- **Renewable resource characterization**
 - Solar and wind, NASA Surface Meteorology and Solar Energy, resource monitoring
 - Waste (solid waste, sewage, waste heat)
 - Ocean thermal and marine current data
 - Integration with the conventional energy
- **Supply curve analysis**
 - Energy efficiency (load management, peak shaving, energy saving)
 - Renewable electricity
 - Renewable fuels
- **Investment strategy planning**
 - Energy efficiency improvement and passive solar investments
 - Public and private sector energy delivery investment/business approaches
 - Financing instruments/subsidies
 - Institutional framework
 - Policy and regulatory framework required for implementation
 - Capacity building and implementation support
 - Strategy
- **SREP Investment and TA Plan – Time slice of plan for 2020 Carbon Neutral**

SREP Quality Assurance

- Draft IPs disclosed for public consultations
- Review and endorsement of IPs by MDBs
- External peer reviewers
- Approval by SREP sub-committee

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Scoping Mission Objective

- Identify key development partners and other stakeholders; this exercise should also lead to identification of potential co-financiers of the SREP;
- Undertake a stocktaking of existing activities and documentation
- Agree on a timetable as well as financial and human resources required to prepare the Investment Plan; and
- Agree on the outline of the IP.

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