

United Nations Development Programme Global Environment Facility

PROJECT BRIEF

IDENTIFIERS

PIMS Number:	3462
Project Title:	Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP)
Project Number:	2699
Country:	Pacific Island Countries (Cook Islands, Fiji, Kiribati, Nauru, Niue, Papua New Guinea, Samoa, Solomon Island, Tonga, Tuvalu and Vanuatu)
GEF Focal Area:	Climate Change
GEF Programming Framework:	Operational Programme 6: Promoting the adoption of renewable energy by removing barriers and reducing implementation costs
GEF Strategic Priority(ies):	SP-4: Productive uses of renewable energy
Eligibility:	Ratified UNFCCC on: Cook Islands (20/04/93); Fiji (25/02/93); Kiribati (06/02/95); Nauru (11/11/93); Niue (27/02/96); Papua New Guinea (16/03/93); Samoa (29/11/94); Solomon Islands (28/12/94); Tonga (01/07/98); Tuvalu (26/10/93); and Vanuatu (25/03/93).
Duration:	5 years
Implementing Agency:	United Nations Development Programme (UNDP)
Executing Agency:	Secretariat of the Pacific Regional Environment Programme (SPREP)

SUMMARY

This project is aimed at reducing the growth rate of GHG emissions from fossil fuel use in the Pacific Island Countries (PICs) through the widespread and cost effective use of their renewable energy (RE) resources. It consists of various activities whose outputs will contribute to the removal of the major barriers to the widespread utilization of RE technologies (RETs). The project is expected to bring about in the PICs: (1) Increased number of successful commercial RE applications; (2) Expanded market for RET applications; (3) Enhanced institutional capacity to design, implement and monitor RE projects; (4) Availability and accessibility of financing to existing and new RE projects; (5) Strengthened legal and regulatory structures in the energy and environmental sectors; and, (6) Increased awareness and knowledge on RE and RETs among key stakeholders.

COSTS AND FINANCING

GEF	US\$ 5,225,000
CO-FINANCING	
Pacific Island Country Governments	US\$ 19,800,000
UNDP	US\$ 500,000
Others	US\$ 500,000
TOTAL PROJECT COST:	US\$ 26,025,000

OPERATIONAL FOCAL POINT ENDORSEMENT

Country GEF Operational Focal Point	Contact Information	Endorsement Letter Signed
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Kiribati: ABETE-REEMA, Tererei	Deputy Director, Environment and Conservation Division Ministry of Environment, Lands and Agriculture Development, PO Box 234, Bikenibeu, Tarawa, Kiribati TEL: 686 28593; FAX: 686 28334 E-mail: mesd2@tskl.net.ki	16 November 2004
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Papua New Guinea: IAMO, Dr. Wari	Secretary Department of Environment and Conservation, P.O. Box 6601, Boroko, National Capital District, Papua New Guinea. Telephone: (675) 325 0180; Facsimile: (675) 325 0182 E-mail: geffocalpoint@daltron.com.pg	25 October 2004
Samoa: SUA, Aiono Mose Pouvi	Chief Executive Officer Ministry of Foreign Affairs and Trade, P.O. Box L1859, Apia, Western Samoa, South Pacific TEL: 658-21171/25313; FAX: 658 21504 E-mail: mfa@mfa.gov.ws	30 November 2004
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Tonga: SAMANI, Uilou	Director of Environment Department of Environment, P.O. Box 917, Nuku'alofa, Tonga TEL: (676) 25050; FAX: (676) 25051 E-mail: usdoe@kalianet.to	12 October 2004
Tuvalu: NELESONE, Panapasi	Secretary to Government Office of the Prime Minister, Private Mail Bag, Funafuti, Tuvalu TEL: 688 20 102; FAX: 688 20 113/114 E-mail: sg@tuvalu.tv	22 November 2004
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List of Abbreviations and Acronyms

ADB	Asian Development Bank
AOSIS	Alliance of Small Islands States
AusAID	Australian Agency for International Development
BPoA	Barbados Programme of Action
BAU	Business-as-Usual
BOS	Balance of system
CC	Climate Change
CDM	Clean Development Mechanism
CO ₂	Carbon Dioxide, major Greenhouse Gas
CROP	Council of Regional Organizations in the Pacific
CTA	Chief Technical Advisor
DANIDA	Danish International Development Agency (DANIDA)
EPC	Electric Power Corporation (Samoa)
UN ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
EWG	Energy Working Group
EU	European Union
EUEI	EU Energy Initiative For Poverty Eradication and Sustainable Development
FEA	Fiji Electricity Authority
FSM	Federated States of Micronesia
GEF	Global Environmental Facility
GHG	Greenhouse Gases (CO ₂ and other emissions such as methane)
IPP	Independent Power Producer
JREC	Johannesburg Renewable Energy Coalition
MDGs	Millennium Development Goals
MEC	Marshall Energy Company
MSP	Medium Size GEF project (i.e. PIREP)
NZAID	New Zealand Aid (previously NZODA)
O&M	Operation and Maintenance
OPRET	Office for the Promotion of Renewable Energy Technologies
OTEC	Ocean Thermal Energy Conversion
PAC	Project Advisory Committee
PEN	Pacific Energy News
PIC	Pacific Island Country
PICCAP	Pacific Island Climate Change Assistance Programme (GEF/UNDP/SPREP)
PIEP	Pacific Islands Energy Policy
PIEPSAP	Pacific Island Energy Policies and Strategic Action Planning (Danish Government/UNDP/SOPAC)
PIESAP	Pacific Islands Energy Strategic Action Plan
PIESD	Pacific Islands Energy for Sustainable Development (WSSD Type II)
PIFRAC	Pacific Islands' Framework for Action on Climate Change, Climate Variability and Sea-Level Rise
PIFS	Pacific Island Forum Secretariat
PIREP	Pacific Islands Renewable Energy Project (GEF/UNDP/SPREP)
PNG	Papua New Guinea
PPA	Pacific Power Association, Power Purchase Agreement
PREA	Pacific Regional Energy Assessment (UN/World Bank)

PREFACE	Pacific rural Renewable Energy France-Australia Common Endeavour (FRANCE/AUSTRALIA/SPC)
PREP	Pacific Regional Energy Program (EU/PIFS)
PV	Photovoltaic
PWD	Public Works Department
RESCO	Renewable Energy Service Company
RE	Renewable Energy
REEP	Renewable Energy and Efficiency Program for the Pacific (ADB/DANIDA)
RETs	Renewable Energy Technologies
RFP	Request for Proposals
RMI	Republic of the Marshall Islands
RREF	Regional Renewable Energy Fund
SIDS	Small Island Developing States
SEC	Solar Energy Company (Kiribati)
SHS	Solar Home Systems
SOPAC	South Pacific Applied Geoscience Commission
SPC	Secretariat of the Pacific Community
SPREP	Secretariat of the Pacific Regional Environmental Programme
TSECS	Tuvalu Solar Electric Co-operative Society
UNFCCC	United Nations Framework Convention on Climate Change
UNDP	United Nations Development Programme
USP	University of the South Pacific

Units of Measure

1 A	=	Ampere	
1 GWh	=	Gigawatt-hour	= 1000 MWh
1 KV	=	Kilovolt	= 1000 volts (V)
1 KVA	=	Kilowatt-ampere	= 1000 VA
1 KW	=	Kilowatt	= 1000 watts (W)
1 KWh	=	Kilowatt-hour	= 1000 Wh
1 MVA	=	Mega-volt ampere	= 1000 KVA
1 MW	=	Megawatt	= 1000 KW
1 MWh	=	Megawatt hour	= 1000 kWh
1 TOE	=	Tonne Oil Equivalent	
1 Gg	=	1000 Tonnes	

PROJECT DESCRIPTION

BACKGROUND AND CONTEXT

1. The Pacific Island Countries (PICs) are currently heavily dependent on fossil fuels, with petroleum accounting for an estimated 90% of the commercial energy consumption. Petroleum consumption is largely responsible for the Greenhouse Gases (GHG) emission in the PICs. A regional synthesis of the PICs GHG inventories from their first National Communication under the United Nations Framework Convention on Climate Change (UNFCCC) highlighted that the GHG emission per capita in the PICs is almost 25% of the global Carbon Dioxide (CO₂) emissions per capita arising from fossil fuel combustion. Most of the GHG emissions in the PICs are from the combustion of fossil fuels for power generation and in transportation. Power generation is only from fossil fuel in most of the PICs and the transport sector utilizes 100% fossil fuel.
2. The impacts of the extreme weather events attributable to climate change are one of the greatest challenges to the sustainable development of the PICs in the 21st century. PICs are among the most vulnerable regions and it is crucial to urgently adapt to the known and potential impacts of climate change, climate variability and sea level rise. Similarly, PICs must urgently join the world community in adopting concrete measures, which will not only reduce the long-term growth in GHG emissions but also at the same time support their sustainable development effort.
3. From 1997-2001, the GEF Global Environmental Facility (GEF) and the United Nations Development Programme (UNDP) country office in Samoa assisted the PICs through a Secretariat of the Pacific Regional Environment Programme (SPREP)-executed Pacific Islands Climate Change Assistance Programme (PICCAP) to build the capacity of the PICs to deal with the challenges of Climate Change (CC) including meeting their reporting requirements under the UNFCCC. The PICCAP has enabled PICs to submit their First National Communications under the UNFCCC. A regional GHG mitigation study conducted under the framework of the PICCAP identified the energy sector as the principal source of GHG emissions in the PICs and recommended renewable energy (RE), energy efficiency and forestry as promising and priority GHG mitigation options.
4. The PICs agreed and requested UNDP and SPREP to pursue a regional GHG mitigation project on RE within the framework of its Climate Change, Sea Level Rise and Variability programme. The GEF in 2002 approved a project preparatory exercise, which is categorised as an OP-6 medium size project (MSP) entitled Pacific Islands Renewable Energy Project (PIREP). Said MSP is implemented by the UNDP and executed by SPREP. The implementation of the PIREP commenced in May 2003 and focussed on the development of a regional approach to the removal of barriers to the widespread utilisation and commercialisation of feasible renewable energy technologies (RETs). This was done through a series of studies, consultations and the establishment of synergies with other related national, regional and international initiatives. Such approach is embodied in the implementation of this proposed comprehensive regional RE project that was designed under PIREP.
5. The consultations that were carried out under PIREP involved continuous national, sub-regional and regional dialogue and consensus building meetings with the national, regional and international stakeholders to identify the priority areas to be addressed in the proposed

comprehensive regional RE project, which is the Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP).

6. PIREP identified major national and regional initiatives, which offers excellent synergies with the PIGGAREP (see section on PREVIOUS, ONGOING AND PIPELINE PROJECTS). These parallel projects are independently funded either by the PIC Governments or through bilateral grants. Most of these are technology demonstration and “equipment-based” projects, which involve the installation of RE-based energy systems. Some of these projects have been subsumed into the proposed regional project as demonstration activities. With the permission of their owners, specific components/features have been added to these parallel demonstration projects to ensure the sustainability of the RE delivery mechanisms applied in each of them, and their enhance commercial viability. In the context of the PIGGAREP, these demonstration projects (which are now integral parts of PIGGAREP) are meant to showcase/demonstrate the design, development, engineering, financing, operation, maintenance, monitoring and evaluation of sustainable and commercially viable RE-based energy system projects. The “business angle” of such projects will be demonstrated. Some of these projects are designed to apply certain RE delivery mechanisms, which are considered more sustainable, and/or supportive of productive uses. These demonstrations are also meant to contribute to the removal of technical, market, finance, policy, institutional and awareness barriers, and that these will operate sustainably and cost competitively against fossil fuel-based systems. Discussions with the proponents/owners of some these projects led to mutually beneficial understandings that made these projects integral parts of the proposed comprehensive regional RE project.
7. PIGGAREP, is presently the only RE barrier removal initiative from the PICs in the International Action Programme adopted at the June 2004 Bonn International Conference on Renewable Energy¹, and is a continuation of the collaborative effort by the GEF, UNDP, SPREP and the PICs to build the capacity of the latter to deal with the challenges of climate change, focussing on GHG mitigation.

CLIMATE CHANGE OVERVIEW

8. The PICs have long been concerned about the serious impacts of human-induced climate change, natural climate variability and sea level rise in the region. It is clear that they are extremely vulnerable to variations in weather, climate and sea level rise, and will be among the first to suffer the impacts of climate change and among the first to be forced to adapt or abandon or relocate from their islands.
9. Over the last decade, the PICs have continually urged the international community to reduce GHG emissions. They have conveyed their concerns over impacts of a changing climate internationally and have given their strong support to a broad range of international agreements, such as, Agenda 21, the Barbados Programme of Action (BPoA) and its recent review, and the UNFCCC and Kyoto Protocol. The PICs, however, remain seriously concerned that global emissions of GHG continue to grow and that their own emission per capita, despite their size and level of development, is about 25% of the global CO₂ emission arising from fossil fuel combustion.

¹ See <http://www.renewables2004/de>

10. The PICs are highly vulnerable to the adverse effects of climate change and its consequences particularly sea level rise, a status, which has been recognised by the BPoA and the UNFCCC. In highlighting their collective vulnerability to climate change, climate variability and sea level rise, the PICs have been at the forefront of international action to understand the impacts of the climate change and to identify critical areas where mitigation and adaptation interventions are urgently needed.
11. There has not been a comprehensive regional effort to mitigate GHG emission in the PICs. Although a number of small-scale rural RE-based electrification projects have been carried out in the PICs over the last two decades, their impacts have been minimal. Most of these previous projects, by their nature (i.e., donor-funded equipment-based demonstrations) were not designed for sustainability, and most of them are non-operational now. Due to these “not-so-good” or less successful experiences from previous RE projects in the region, the overall confidence on the RETs, particularly by the direct beneficiaries (e.g., rural people, prospective project developers) is relatively low. However, despite these rather discouraging experience, the PIC governments understand the benefits of developing and utilizing their respective countries RE resources for supporting national development, and for contributing to the mitigation of climate change in the region. It is also well recognized that PICs are economically vulnerable to the upward trend in fossil fuel prices, and thus, need to make use of feasible available alternative energy resources.
12. The studies carried out under the preparatory phase of PIGGAREP (i.e., PIREP) have shown that the application of feasible RETs for reducing the reliance on fossil fuel and mitigating GHG emission has been constrained by many closely interrelated and intertwined barriers. These barriers were analysed, verified and confirmed during the regional logical framework analysis (LFA) design workshop that was conducted under PIREP in July 2004 and attended by the PICs and key regional project stakeholders. The severity of the barriers in each PIC vary due to the marked differences in the socio-economic, physical and political environment of each country and the available local capacity to address the barriers. Hence, in the context of the proposed regional initiative, there was no prioritisation of the barriers. Nevertheless, the LFA workshop agreed that all the barriers are important, interrelated and intertwined and must be dealt with in a comprehensive manner, preferably on a country-by-country basis. The common barriers on RE development and RET applications among the PICs are summarized as follows: (see more details in the section Barrier to RE Development)

Type	Barriers
Technical	Lack of sustainable RE-based energy system installations on the ground
	Absence of guidelines on RE technical specifications suitable for the PICs
Market	Lack of private sector involvement in RE service delivery
	High costs of delivering RE services
Institutional	Inadequate capacity to address the challenges of climate change, including the design and implementation of RE projects
	Ineffective coordination among stakeholders
Fiscal & Financial	Absence of sustainable capital fund for RE development
	Local investors are not confident on RE application projects
	Biased fiscal policies

Type	Barriers
Legislative, regulatory and policy	Climate Change and Energy Legislations and Policies are either not in place or ineffective.
Knowledge, awareness and information	PICs lack qualified nationals in the area of RE applications
	Inadequate national public awareness campaigns
	Inadequate dissemination of information on best practices and success stories
	Lack of knowledge about the RE resources potentials in the PICs
	People in rural areas in the PICs lack knowledge about climate change and its links to renewable energy
	Absence of guidelines on RE technical specifications suitable for the PICs

GREENHOUSE GAS MITIGATION AND RENEWABLE ENERGY

13. In the last decade, the Pacific Island Leaders' Forum meetings have consistently advocated taking measures to address the problems of global warming and sea level rise. The Leaders have continuously called for the adoption of concrete measures to develop and utilise RE technologies as one of the effective means of addressing these problems. They have highlighted the importance that Forum members place on domestic actions to reduce emissions. They further recognised the benefits of encouraging RE and energy efficiency to advance the reduction of greenhouse gas emissions.
14. In 2000, the Leaders adopted a Regional Framework for Action on Climate Variability, Change and Sea Level Rise. This regional framework is the region's blueprint for collective actions on Climate Change by PICs, organizations and individuals and is supported by an annual multi-stakeholder roundtable process. The framework, currently under review, highlights Renewable Energy, Energy Efficiency and Forestry as priority GHG mitigation options for the PICs.
15. GHG mitigation in the PICs involves the cooperative effort of the Departments of Environment and the Energy Offices. Both the Environment and Energy officials in the PICs have appreciated that the preparatory work (PIREP) in developing this project (i.e. PIGGAREP) has created closer and more productive working relationships between these two key government offices.
16. The PICs are at varying stages of their preparedness to adopt measures to deal with climate change. High-level national task forces, with energy sector representations, have been established under the Environment Departments to coordinate and advise governments on all matters relating to climate change. PICs are at varying stages of developing appropriate legislations and policies to guide its effort to deal with the climate change challenges.
17. The PICs are also at varying stages of developing their energy sectors. The rate of electrification ranges from 10-100% but in general about 70% of the people in the PICs still do not have access to electricity. The share of RE in the power generation mix ranges from 0% in most PICs to more than 50% in a few. Petroleum import is equivalent to about 20% of the total exports of a few to more than 40% in most. Power utilities are at varying stages of transformations with some undergoing either corporatisation, privatisation or still maintaining their government-owned entities. Energy planning, policy formulation and rural RE electrification are the responsibilities

of Energy Offices with varying but inadequate degrees of legislative authorities, human capacity and financial support. On the other hand, the existence of national energy policies varies from “adopted but not enforced” to varying stages of drafts. At the regional level, the Energy Working Group of the Council of Regional Organizations in the Pacific (CROP EWG) is presently reviewing and finalising a Pacific Islands Energy Policy (PIEP) and a Pacific Islands Energy Strategic Action Plan (PIESAP) to be adopted by PICs Leaders through the Pacific Islands Forum. The drafts PIEP and PIESAP highlights the priority that the region places on utilising feasible RE and energy efficiency technologies for mitigating GHG emission and supporting the region’s sustainable development effort. See PICs Energy Sector Profiles in Annex J.

EXPERIENCES WITH RE IN THE PICs

18. RE technologies have been known in the region during the last 3 decades. The interest, among the PICs, in them have mostly been driven by the oil price shocks during those periods, various donor support programmes and with a generalised understanding of the RE resources potential. A lot of the past RE projects have been to demonstrate the adaptability of the technologies to the PICs environment and for rural development purposes. The development of RE in the PICs is now driven from these two perspectives: (1) Sustainable development; and, (2) Sustainable environment. The present approach is considered more participatory and holistic, and has better chances of success.
19. Investments and projects have mainly taken place in three different contexts or categories: Firstly, hydropower resources have been developed in the framework of regional utilities least cost power expansion plans and financed through public sector utilities, often with support from multilateral lending agencies. Secondly, there have been a series of donor grant financed rural electrification projects using mainly photovoltaic (PV) and mini/micro hydro and more recently also wind and hybrid systems. These have also included small-scale biogas digesters and woodstoves. Thirdly, there have been private sector or utility investments that include biomass fuelled power generation (Fiji, Solomon Is), geothermal energy (PNG), power supply for remote telecommunication (solar and wind), and solar water heating for private households in most PICs.
20. Due to the diversity of available RE resources in the different PICs, it would not be logical to come up with what could be the priority RETs in the region. Each PIC however, depending on the available RE resource can come up with several RET application projects, which they can prioritise based on country-defined criteria. The national assessments that were carried out under PIREP have identified Nauru, Niue, Palau, Samoa and Tuvalu as suitable for grid applications while there are large opportunities for both grid and off-grid applications in Fiji, FSM, Kiribati, Marshall Islands, PNG, Solomon Islands and Vanuatu. Tonga has opportunities for both on-grid and off-grid RET applications for rural electrification. The Table below shows the PIREP study’s estimate of the potential GHG savings (ktons CO₂) for each RE resource in each PIC. The economics and the technical feasibilities of harnessing these RE resources were not evaluated in detail during PIREP but will be dealt more comprehensively within the PIGGAREP.

Country	Year	Geo-thermal	Hydro	Bio-diesel	Ethanol	Other Biomass	Solar PV	Wind
Cook Is	2013	0	0	2.6	0	0	2.1	6.3
Fiji	2010	43	818	4	27	17	1	19

Country	Year	Geo-thermal	Hydro	Bio-diesel	Ethanol	Other Biomass	Solar PV	Wind
FSM	2012	0	14.2	2.3	0	0	0.3	0
Kiribati	2013	0	0	20.8	0	0	— 3.7 —	
Marsh. Is	2013	0	0	7.6	0	0	0.4	0
Nauru	2013	0	0	0	0	0	2.8	0
Niue	2012	0	0	0	0	0	— 0.64 —	
Palau	2013	0	0	0	0	0	12	0
PNG	2011	333	691	113	430	Very small	9	10
Samoa	2013	12.8	40.2	27	0	0.3	2.5	1.1
Sol. Is	2012	Low	31	75	0	2	3	1
Tokelau	2013	0	0	————— 0.15 —————				0
Tonga	2010	0	0	27	0	0	1.4	2.8
Tuvalu	2013	0	0	————— 0.8 —————				0
Vanuatu	2013	17	14	75.6	0	1	2	1

Sources: PIREP Regional Overview Report

Biomass

21. Biomass based power generation (bagasse and wood wastes) with capacities of several MW have been operated successfully in Fiji for several decades. There have also been trials using various gasification technologies, the most successful of which was the use of gasification units for crop drying. There have also been trials using coconut oil as a diesel fuel substitute in stationary and mobile diesel engines. In line with experiences elsewhere in the world, results of these trials suggest that various diesel engines can be operated using straight vegetable oil or blends. The biofuel option has however never been systematically researched in the Pacific, a task that should be tackled given the strategic potential vegetable oil based biofuels could have for the region.

Hydro

22. In the Pacific, hydroelectric systems range in size from a few kilowatts for village electrification to the Monasavu hydro facility in Fiji at 80 Megawatts that provides much of Fiji's electricity. All but the largest hydro schemes are usually "run-of-the-river" designs with no more than a few hours of water storage available. However, in terms of RE, the hydro installations of the mountainous PICs are major RE sources and have the potential for providing a high percentage of the electricity supply for national utilities. There is also considerable development possibility for village scale mini-grids using hydropower and a number of installations have been made in PNG, Fiji, Vanuatu and the Solomon Islands. Unfortunately, village installations have not generally been reliable power sources due to the inability of the villages to access the technical support necessary. Problems have been primarily with the electrical components, particularly turbine speed controllers and alternators, but designs that have not adequately considered the problem of flooding have also contributed to the problem.

Geothermal

23. Although geothermal assessments have been made in Fiji, PNG, Vanuatu other PICs for decades, PNG is the only PIC that has actually installed a geothermal energy extraction installation. The

private installation at the Lihir Gold mining site has a 6 MW capacity and is extending the facility to 20-30 MW. The installation has a natural steam source and serves not only to generate electricity but also to help control conditions in the mine by diverting the naturally occurring steam away from mining areas. Recently, there has also been interest by the private sector to develop a geothermal source in Vanuatu as an Independent Power Producer (IPP) project.

Wind

24. Although a number of wind generators have been installed in the Pacific over the years, only a few very small privately owned or Telecom owned units have remained in service more than four or five years. Currently, two installations are generating electricity for small grids. One in Mangaia, the Cook Islands and one in Fiji at Nabouwalu, Vanua Levu. The Mangaia installation includes two 20kW turbines funded by the Pacific rural Renewable Energy France-Australia Common Endeavour (PREFACE) project (France/Australia funding) that feed into the Mangaia grid. The Fiji installation includes 8 – 6.7kW Bergey wind turbines that, with 37.44 kWp of PV and 200 kVa of diesel generation comprise the Nabouwalu hybrid generation system serving the Government station at Nabouwalu. Both the Fiji (1998) and the Cook Islands (2002) installations have been in place too short a time to make recommendations regarding replication. The Nabouwalu wind array has had problems with maintenance and several times individual turbines have been out of service for extended periods awaiting repair. Both electrical and mechanical problems have occurred though electrical problems seem to be the primary cause of turbine outages. The Mangaia turbines still have not completed the commissioning process and though they have been feeding power to the grid several months, the units are not yet considered fully operational in all aspects. A 20kW wind turbine has been installed at the SOPAC site in Fiji (2004) for training and demonstration purposes but no operational data is yet available.

Solar Thermal

25. Solar water heaters for domestic, commercial and industrial use are commercially available in the PICs. Tonga, Fiji and PNG have small manufacturers of solar water heaters and large numbers have also been imported from Australia. The most consistent use for solar water heaters is to provide piped hot water for hotels and guesthouses. A few countries, notably the Cook Islands, have many domestic installations as well, but since piped hot water has not been a common component of housing in the Pacific, solar water heating has not had a strong market in most of the PICs.

Solar PV

26. Solar PV first was used as power source for telecommunications in the late 1970s and continues to be used throughout the Pacific for powering remote repeaters and island telephones. The first village scale trials of solar PV began in Fiji in 1983 and by 1984 Tuvalu and Kiribati had established rural electrification programmes using solar PV as the power source. The early trials had a very low long-term success rate, partly because of poor technical designs and partly because of inadequate provision for long-term maintenance. By the 1990s, technical designs had become more reliable and institutional designs had evolved to better provide for the long-term sustainability of PV based rural electrification. By 1995, Fiji, Tonga, Tuvalu and Kiribati each had their own style of PV based rural electrification incorporating over 1000 Solar Home Systems (SHS) altogether. From 1995 to the present, the growth in number of installed systems has been rapid and by 2006 several thousand homes in the PICs will have been electrified using

solar PV. At the same time system costs have gone down and better and more reliable components are now available in the market. Now a “typical” SHS unit has a peak capacity of about 150 W, a heavy-duty solar battery, state of the art regulator, a DC/DC converter and a rack. In recent projects, hardware cost for such systems were in the range of US\$3,000.

27. In most of the PICs, village water supply and small scale water pumping for schools, clinics and houses has been a useful application of PV. Success has been variable but well designed systems using simple technology have operated successfully for decades and clearly have been cost effective. More complex installations, notably those using positive displacement pumps with associated electronic controls, have had lower reliability and a higher maintenance requirement but, if maintenance is properly carried out and pumps used that have had good prior Pacific experience, those installations can also provide good economic value. There have also been trials of “focal point” electrification using solar PV. That is, just electrification of community facilities without extending electrification to homes. That has not been widely accepted and maintenance of the systems has generally been poor since it has proven difficult to get communities to accept the financial responsibility for battery replacement and other repairs and to have sufficient technical capacity for general preventive maintenance and service of the systems. Most of the PICs have at one time or another been the recipient of a programme for the electrification of health clinics, usually with the inclusion of a vaccine storage refrigerator, power for lights and for a communications radio. Abuse of the systems, poor maintenance and lack of a financial commitment by the agencies responsible have caused the systems to provide unreliable service and to have a short life. Some PICs have, over a 20-year period, received donor assistance to electrify the same clinics as many as three times because earlier systems have not been maintained and had failed. An exception has been Kiribati where the Department of Health contracts with the Solar Energy Company (SEC) for maintenance and has made the necessary financial commitment to maintenance and repair.

Ocean Thermal

25. In 1981, an experimental 100 kW (gross) closed cycle Ocean Thermal Energy Conversion (OTEC) power plant operated in Nauru but ran into technical problems in its early days. This was the first land based OTEC installation in the world and since then no other installation has been attempted in the PICs. A 150kW (gross) open cycle experimental OTEC plant was built in Hawaii in the 1990s and currently a 1 MW (gross) floating open cycle OTEC plant is being constructed off the coast of India but has faced many delays and engineering problems. Palau is presently liaising with the Saga University of Japan for the setting up of OTEC power plants at seven locations in the country, starting with a 3 MW pilot power plant.

Hybrid Systems

26. Fiji has installed several hybrid power generation systems. Fiji Telecom installed a wind/diesel hybrid at a site on Viti Levu and has a wind/PV hybrid power system for charging backup batteries at several remote sites. The wind/diesel hybrid power system has been dismantled but the battery charging systems have been satisfactory and continue in use. The only installation in the Pacific designed specifically as a hybrid and intended for power generation is the Nabouwalu wind/PV/diesel installation. It includes eight 6.7kW rated wind turbines 37.44kW of solar PV and 200 kVA of diesel generation. The system includes battery storage for the PV to eliminate the rapid power fluctuation from the PV panel in partly cloudy conditions and to help serve the peak demand time, which is in the evening after the sunsets. The system design energy delivery

is 720 kWh/day representing around 60% of total generation from renewable sources. However, over the five years time the component of energy from RE has fallen from 60% to less than 15% due to technical problems, the complexities of the system and the lack of training and/or qualified staff to replace those persons originally trained under the project.

PREVIOUS, ONGOING AND PIPELINE PROJECTS

27. The proposed regional RE project has direct linkages to international, regional and national projects and programmes. These include UNDP's Millennium Development Goal (MDGs) activities including the current Asia-Pacific regional environment and energy programmes. UNDP's sub-regional office in Apia, Samoa covers the area of energy and environment through the implementation of a number of past, ongoing and planned regional projects including the PIREP and earlier on, the PICCAP – a regional CC Enabling Activities initiative that covered 10 PICs. That regional project was executed and coordinated through the PICs regional Climate Change, Climate Variability and Sea Level Rise Programme, housed at SPREP. This programme deals with strengthening the capacity of PICs to deal with the challenges of climate change, including meteorology, adaptation, legal and policy advise and GHG mitigation including Ozone Depleting Substances.
28. The proposed regional project has linkages to the ongoing and planned international, regional and bi-lateral projects and associated activities in the region listed below. Some of these have parallel activities that, as per agreement with the project proponents/owners, would be subsumed in the proposed regional RE project. It should be noted that these projects are funded separately and are among the co-financed activities of the PIGGAREP. As part of the regional project (and indicated in the project planning matrix), their results are reported as among the outputs of PIGGAREP. The hardware installations involved in these projects will make up part of the PIGGAREP's demonstration projects, and as such, GEF resources will not be used for the purchase of such hardware. The matching of these hardware-based projects and PIGGAREP's soft assistance is very important, inasmuch as the number of future financially sustainable and economically competitive RE-based energy system projects in the region would manifest the success of the PIGGAREP interventions.

Regional and International

- a. *Pacific Islands Renewable Energy Project (PIREP)* – This is the soon-to-be completed GEF-supported regional OP-6 project that is aimed at developing a regional approach to removing barriers to the development and commercialisation of RE systems in the PICs. The proposed comprehensive regional RE project, which is the PIGGAREP, is designed and developed under the PIREP.
- b. *Asian Development Bank's Renewable Energy and Energy Efficiency Program (REEP) - (2004-2006)* - REEP is a technical assistance project of the Asian Development Bank (ADB) funded by the Danish Government and is intended to provide capacity building assistance to Fiji and Samoa. The overall goal of the project is to help Fiji and Samoa increase their capacity to develop, fund and implement RE and energy efficiency projects while emphasizing market driven structures. (*Ongoing*)
- c. *Capacity Building for development of adaptation measures in Pacific Island Countries (CBDAMPIC) - (2000-2005)* – This is a Canadian government funded project and is part of

SPREP's Climate Change, Climate Variability and Sea Level Rise Programme. The project is assisting PICs to develop and implement a capacity-building programme that will strengthen their capability to deal with climate change issues, including drafting of national climate change policies and legislations. (*Ongoing*)

- d. Support to the energy sector in five ACP Pacific Islands *under the European Union (EU) 9th EDF for the FSM, Nauru, Niue, Palau and RMI - (2005-2010)* – Tentatively this project among others will provide solar street lighting to Palau, PV systems for schools in RMI, wind power for Niue, grid-connected PV in Nauru and PV and bio-fuel in FSM. (*Ongoing*)
- e. *Pacific Islands Energy Policy and Strategic Action Planning (PIEPSAP) (2004 - 2007)* - PIEPSAP is a joint partnership initiative between the EU Energy Initiative For Poverty Eradication and Sustainable Development (EUEI) and the Pacific Islands Energy for Sustainable Development Initiative (PIESD). The project aims to improve the capacity of PICs to develop practical national energy policies, and the strategic action plans to implement the policies. It is expected that a framework of national energy policies, plans and practical mechanisms will be in place within the PICs, which influence national efforts toward achieving “available, reliable, affordable, and environmentally sound energy for the sustainable development for all Pacific islanders.”(*Ongoing*)
- f. *Pacific Islands Global Climate Observing System (PI-GCOS) – (2003-2008)* - This project is aimed at strengthening the capacity of PICs Meteorological Services to be able to collect and analyse climatic and hydrological data for planning and infrastructure designs. (*Ongoing*)
- g. *Pacific rural Renewable Energy France-Australia Common Endeavour (PREFACE) - (2000-2003)* - PREFACE was a joint attempt by the governments of Australia and France to advance the social and economic development of the member countries of the Secretariat of the Pacific Community (SPC) through the use of sustainable RE technologies. Four demonstration projects were completed in the Cook Is (grid-connected wind power), RMI (PV rehabilitation), Tonga (solar home systems) and Vanuatu (community solar systems) under PREFACE. (*Installations have been completed but monitoring and nurturing are ongoing*)
- h. *Second National Communication to the UNFCCC - (2005-2009)* – This project, which will be carried out by each PIC, is for the preparation of their individual Second National Communication to the UNFCCC. The PICs have agreed to engage the services of SPREP, under its Climate Change, Climate Variability and Sea Level Rise Programme to assist in the implementation of their vulnerability and adaptation to climate change assessments, conduct of GHG inventories and in the formulation of policies and measures to improve their resilience and to mitigate GHG emissions. (*Ongoing*)
- i. *UNDP's Regional Energy Programme for Poverty Reduction Project (REP-PoR) - (2005-2008)* – This US\$2,782,500 Asia-Pacific regional energy programme aims to contribute towards the achievement of MDGs target, through broad-based interventions in three thematic areas of priority: (i) Improving access to energy services; ii) Promoting efficient use of energy; and iii) Increasing access to financing for sustainable energy. The three strategic services: a) policy advocacy; b) capacity development and action research; and, c) knowledge management are key to translate proposed thematic interventions to mainstream energy into

developmental agenda for poverty reduction and vice-versa, i.e., poverty reduction mainstreamed into the energy development agenda. (*Ongoing*)

- j. *UN ESCAP's Institutional Capacity Building on RE Training Project (2002-2005)* - This UNESCAP, in close collaboration with the CROP EWG, is presently developing this project for improving the training on RE in the PICs. (*Ongoing*)
- k. *European Union Energy Facility for ACP Countries* - The proposed first phase of this €250 million project will deliver outputs in the fields of energy efficiency and renewable energy to ACP countries, including the 10 PIGGAREP PICs. (Planned)

Bilateral

- l. *Cook Is: OTEC, Wind Power Development in Aitutaki, Mangaia and Rarotonga and Waste to Energy projects* – These are projects that are currently under discussions with donors. (OTEC and Waste projects are planned and wind power development are ongoing)
- m. *Fiji: Fiji Renewable Energy Hybrid Power Systems - (2001-2004)* - This GEF-funded project is aimed at reducing CO₂ emissions through the setting up a sustainable institutional framework to promote commercial RE technologies and RE service companies (RESCO) in Fiji's rural electrification programme. (*Ongoing*)
- n. *Fiji: The Fiji Electricity Authority's Renewable Energy Development Programme* – This program is in line with the mission of the FEA to provide clean and affordable energy solutions to Fiji and the Pacific. FEA is aiming at providing all energy through renewable resources by 2011. It currently has major investments on RE-based power generation, particularly on wind and hydro. (*Ongoing*)
- o. *Kiribati: The EU-funded solar PV electrification programme* – This is a EU-funded large scale project that would expand Kiribati's Solar Energy Company's (SEC) customer base to 2000 homes on all the islands of the Gilbert Island group. That expansion is currently underway and the SEC is already considering the next expansion phase to further increase coverage in the Gilbert Islands and possibly expands to the Line Islands. In addition to household electrification, solar PV powers street lighting, health centres, schools, community buildings (*maneabas*), communications systems and water pumps.
- p. *Papua New Guinea* - Proposed Bongo/Kawa micro hydropower development and wind power development projects. These projects are under discussions with donors.
- q. *Samoa: ADB's Power Sector Improvement Project in Samoa* - This project will expand the Afulilo hydropower scheme in Samoa, increasing the reservoir's storage volume by 50% to 15 million m³ and install a third 2 MW generator at the Ta'elefaga power station and construct a 7.1 kilometre gravity diversion canal.
- r. *Samoa: ADB's US\$10 million loan programmed for 2005* – This loan project will involve the utilization of indigenous RE resources to provide least-cost reliable electricity to help reduce poverty and develop private sector activities on the island of Savaii, Samoa.

- s. *Samoa: Coconut Oil for Power Generation (CocoGen²)*. During the program cycle 2003-2007 UNDP will provide US\$100,000 for this collaboration project between the Electric Power Corporation (EPC), Government of Samoa and UNDP. (*Ongoing*)
- t. *Samoa: The Apolima Photovoltaic (PV) project*. During the program cycle 2003-2007 UNDP will provide US\$20,000 for this collaboration project between EPC, Government of Samoa and UNDP with an estimated budget of US\$117,000. (*Planned*)
- u. *Tonga: The New Zealand government's assistance to provide solar PV for the island of Niuafu'ou in Tonga - (2005-2007)* - This is an NZAID-funded project to provide solar PV to the island of Niuafu'ou in Tonga. (*Ongoing*)
- v. *Tonga: The Ha'apai Solar Electricity Committee's management of its Ha'apai Solar Electrification programme*. (*Ongoing*)
- w. *Tonga: Grid-connected and stand alone PV power development*. Preliminary studies have been carried out with the Japanese. The next phase is currently under discussions. (*Ongoing*)
- x. *Vanuatu: Vanuatu Energy Ministry's village-based micro hydroelectricity program: Maewo Island pilot scheme* - This program follows Vanuatu's long-term goal for 100% renewable energy. This pilot scheme is a priority for building upon a working rural electrification model found effective in the Solomon Islands and thus potentially enabling regional cooperation. The pilot will build experience by maximizing local content and capacity building.

BARRIERS TO RENEWABLE ENERGY DEVELOPMENT AND APPLICATION

29. The barriers described in the following paragraphs have been identified in more than 3 PICs countries, and as per understanding among the stakeholders are therefore considered regional in nature. Even though the same set of barriers are found in all the PICs, their magnitude and importance varies from country to country based on the socio-economic, physical and political environment of each country and the available local capacity to address the barriers. The awareness barrier in a PIC with many outer islands (e.g., Tuvalu) would be a bigger issue and will be dealt with differently as compared to a single island PIC (e.g., Nauru, Niue). However, all the barriers are closely interlinked and intertwined and need to be dealt with comprehensively and in line with the available local capacity.

30. Technical Barriers

- a. Poor technical designs of some RE projects have resulted in poor quality of service and the confidence level of stakeholders for new RE projects is therefore low. Communities have been known to reject solar PV electrification even when provided as an outright gift because they anticipated poor service and accepting PV meant rejecting the possibility of receiving another electrification technology in the future. Some RE technologies such as picohydro or wind generators have not yet had a sufficiently strong experience base in the PICs to determine which component specifications are critical for long-term reliability and cost

² This was originally proposed as a MSP to be developed using PDF-A funds, but the Samoan Government decided to have it funded from other sources. UNDP is providing funds for the techno-economic evaluation activities.

effective service. Therefore each project tends to be a test bed for the installed components with component failure more common than success.

- b. Incorporating rapidly varying energy sources into a small grid system is technically difficult and there are limits to the extent that intermittent sources can be integrated into a grid system.
- c. Many of the PICs have a relatively high frequency of cyclone/typhoon passage. This makes wind and ocean energy installations more risky for large-scale investment. Solar PV installations also are at risk though installation methods that take storm passages into consideration have been shown to keep that risk to a minimum. The physical environment of the PICs is harsh for mechanical and electronic systems. There has to be special designs for mechanical systems and electronic components that prevent the high temperature, high humidity and salt laden environment of the PICs from shortening their service life or dramatically increasing maintenance costs.
- d. The development of large-scale biomass energy projects requires a reliable and predictably priced supply of raw material. That is very difficult to achieve in the PICs because of great fragmentation of land ownership and/or land tenure issues that require project operators to deal with large numbers of suppliers with the associated high transaction costs. Relatively high-income expectations by rural dwellers, in most of the PICs constrain the production of biofuels at cost competitive with imported diesel fuel.

31. Market Barriers

- a. Although not applicable to Niue and Nauru as single island states, the rest of the PICs include remote islands and areas that have little access infrastructure that have small populations, are expensive to access and have little technical capacity. On an individual country basis and in smaller PICs in particular, that makes delivery of services difficult, maintenance of installed facilities costly, and investments on RET applications unprofitable. However, in the larger PICs like Fiji and PNG and on a sub-regional and regional basis, the economies of scale would be much better and so will be the profit margin. This however will only be confirmed from detailed studies that will be carried out under PIGGAREP. The absence of financially sustainable and economically competitive RE-based energy system installations in many PICs (coupled with the absence of the relevant incentives and policies) has made it less convincing for the private sector to make investments in RETs due to the rather risky and non-profitable nature of the undertaking.
- b. PICs are often unaware that they have promising RE resources and RET applications, which can be studied to confirm their viability and then marketed, to donors, investors and financing institutions. Very often, financing and project identification missions conducted by multilateral and bilateral aid agencies do come around the PICs, but completed ‘bankable projects’ project studies and proposals are not available on hand to be presented and discussed with these missions.
- c. Markets have also been influenced by donor projects that provided RET for free or against very small nominal charges. This has created expectations amongst populations to be served free of charge, an attitude that makes it impossible for private sector suppliers to enter the market. There is a general lack of understanding of the rural energy markets. An evidence of this is the assumption that all households will be happy with the same capacity installation. In

rural areas, as well as in urban areas, some households are quite poor and can afford only minimal electrification while others have the resources to make good use of a much larger energy supply. The provision of a single electrification capacity to all households makes it impossible for the very poor in rural communities to have access and also does not provide satisfaction to the households with above average requirements for energy.

32. Institutional Barriers

- a. As both GHG mitigation through the utilization of RE resources and the application of RETs are cross-sectoral and multi-dimensional subjects involving power utilities, environment and energy offices, private sector and community groups, the participation, consultations and the coordination of stakeholders' inputs must be conducted in a very effective manner.
- b. Presently in the PICs (both in the government and private sectors), there is inadequate capacity to plan, design, implement, monitor and evaluate RE projects. All the PICs have done relatively poorly in the local design of RE projects, depending largely on external consultants. As a result, projects often use equipment poorly suited to the PIC environment e.g., complex systems that are beyond the ability of local personnel to operate and maintain.
- c. While the private sector has been better at meeting the needs of recipients there are also many examples of poor technical designs and inadequate provision for after market support by the private sector. Despite this, the private sector is still seen as a major driver of RETs in the PICs. It should be noted that the private sector is among those that want to see first that RET applications are successfully operating on the ground to motivate them to invest their resources to such endeavours.
- c. Most PICs have not provided for project support for the long term. Barriers include inadequate spare parts arrangements, non-existing training for new operating and maintenance personnel replacing those originally trained at the time of installation, and lack of a commitment to the collection of fees/tariffs from users. Project monitoring has generally been poor and problems have not been recognized until they become so serious that their solution required a major rehabilitation effort. The lack of standards for technical systems that focus on sustainability and reliability of installed RE systems has resulted in the repeated use of components and installation methods already known to have poor performance in the PICs. A lack of certification requirements for technical labour associated with RE systems has been a major factor in allowing the existing low standard of maintenance for most rural development projects.
- d. The conservative nature and the reluctance to change and be innovative in energy related institutions make it difficult for them to accept new technologies and operational structures. There is a strong tendency for utilities to focus on grid delivery systems and on generation technology that has been successful in the past. The same is true for RE agencies where a tendency to reject unfamiliar technologies such as wind or biofuels and to promote the use of more familiar technologies such as solar PV can be observed.
- e. A serious barrier among donor institutions is the very long time needed to develop projects. Long lead times prevent addressing immediate issues and create expectations on the part of government and recipients that cannot be fulfilled for an extended period.

33. Financing/Funding Barriers

- a. Markets in many PICs are distorted in favour of subsidized electricity and petroleum products supply. Thus RE is not allowed to compete on the basis of the real economic cost of using conventional electricity supply processes and fossil fuels. Often the real economic cost of electricity and other energy sources are not known and few PICs have the information or capacity to determine the real cost of energy supply including externalities such as environmental cost and security of supply. Due to this lack of understanding of the real cost of energy supply, comparison of the economic competitiveness between conventional and RE technologies cannot be made accurately. Since, conventional technologies such as the use of diesel-based power generation units are what are typically known to many people, and therefore regarded as easier than RETs that they are not familiar with, most of the analyses tend to be biased towards conventional technologies and thereby contribute to the inadequate funding allocated to energy offices to monitor RE pilot projects and to correct problems that occur in those projects.
- b. Although it is presently relatively easy to develop large-scale RE projects using donor funding, there is inadequate access to finance for small projects and to rehabilitate failing projects because financing institutions are not furnished with convincing economic comparisons of RE-based energy system projects against similar projects which fossil fuel-based. This has made it generally impractical to attempt focused development of rural productivity projects where a very specific activity in a specific community can use RE for productive uses. It also has caused a tendency to develop new projects and abandon old ones that have failed. There is no facility that can support viable projects according to clear transparent financing rules where incentives and support can be applied equally to both RET and fossil fuel-based technology. Local financing institutions have not entered the market for RE funding and there is generally a lack of understanding in the finance sectors with respect to the long term financing needs for the application of RETs. The unusually high up-front cost of RET result in a risk profile that financing institutions cannot evaluate. Similarly, the private sector are not willing to invest in RET applications due to the absence of financially sustainable and economically competitive RE-based energy system installations in the PICs.

34. Policy and Regulatory Barriers

- a. Very few PICs have environment and energy legislations and none has GHG and/or RE targets in place. A lot of the PICs are in the process of developing their climate change and energy policies and there are some who have adopted theirs but are not enforced. As a result, implementation of RE projects is usually *ad hoc* and there is no allocation of responsibility to follow any RE development guidelines or to ensure that projects consider the experience of earlier implementations of the same technology. This has resulted in many projects being implemented that repeat the same errors of design as earlier projects by other agencies in the same country. Also, without a policy that is accepted at all levels of Government, policies change with changes in government and long-term project goals cannot be achieved.

35. Knowledge and Information Barriers

- a. Information about the benefits of RE has not been well disseminated in most PICs. Public leaders, private citizens and private sector entrepreneurs have too limited an understanding of RE to be able to make informed decisions about policies, purchases or investments.

- b. There is inefficient distribution of information about experiences with RE technology applications between PICs and sometimes within a single PIC. Many RE projects have used components, institutional systems and system designs shown in other PICs to be failure prone and have failed to replicate successful projects. There is also insufficient access to quality information on experiences that have been made outside the region.

BASELINE SCENARIO

36. The baseline scenario (i.e., business-as-usual) in the area of RE development, promotion and application of feasible RE technologies is characterized by growth in the energy demand and supply of the PICs that would involve little or no successful commercial development of RE resources over the coming decade. Under this scenario, the growing demand for electricity and for liquid fuels would primarily be met by building new diesel fired power generation plants and by an increased import of liquid fossil fuels for electricity generation and transport sector use. Based on the PIREP Regional Overview Report, there is about 365.3 MW available RE capacities in the region that can offset conventional energy used for electricity generation: Cook Islands (2,140); Fiji (107,496); FSM (2,860); Kiribati (143); Nauru (15); Niue (22); Palau (529); PNG (238,105); RMI (137); Samoa (11,210); Solomon Islands (640); Tokelau (31.5); Tonga (1,104); Tuvalu (115); and, Vanuatu (918).

37. Under the business-as-usual (BAU) scenario, the following are anticipated:

- a. GHG emissions from the use of fossil fuels will continue to grow rapidly and mostly unabated;
- b. Increasing dependence on imported and expensive energy forms, will continue to contribute to significant current account deficits and to a high vulnerability of PICs with respect to price shocks in the world energy markets;
- c. Local air pollution due to combustion of fossil fuels will increase;
- d. Fragile coastal ecosystems will remain endangered by hazards related to transport and use of fossil fuels;
- e. Greenhouse gas mitigation activities and RE developments will be carried out without clear sense of direction and guidance;
- f. Rural electrification efforts will be restricted to mostly grid extensions, remote and rural areas will remain without convenient and efficient modern forms of energy, and reliable electricity supply;
- g. Productive uses of RE, which could improve livelihoods and promote income generation in rural areas are not taken advantage of;
- h. No development of local industries with adequate capacities to manufacture RE system products and components and to supply RE related services;
- i. The region's private sector will continue to play a marginal role as investors and providers of RE based energy services if they cannot see financially sustainable and economically competitive projects on the ground;
- j. Funding of RE initiatives – if they take place – will be outside the established local financial systems and channelled through donor organizations without giving local financial institutions a chance to acquire lending/financing capacity for RE;
- k. Urgently needed legislation and policy reform processes to adequately support sustainable development principles will not be initiated;

- l. Insufficient scarce public resources will be allocated to support the rural poor and reduce the electricity access gap between urban and rural areas;
 - m. Experiences in the region will not be effectively shared and scale economies in project preparation (procurement of specialized services) and capacity building (training workshops etc) will not accrue; and,
 - n. Coordination between ongoing and planned activities on RE will be inefficient, or none.
38. Furthermore, if the present situation in the area of RE development and utilization in the PICs is not addressed the region will fall further behind dynamic global RE developments that have already started in other parts of the world; progress towards achieving the Millennium Development Goals (MDGs) in the region will be hampered; and, there will be no additional strong basis for PICs negotiating on positions at the Conference of the Parties to the UNFCCC.
39. The implication of the above scenario is a continued reliance of the PICs on petroleum fuels to meet energy needs with a strong likelihood of unsustainable energy sector development.

ALTERNATIVE SCENARIO

40. In the Alternative Scenario, changes are not expected unless, first and foremost, politicians, senior government officials, investors, financiers, the civil society and the general public hear, touch, see and read financially sustainable and economically competitive RE projects on the ground and these projects are not only bringing about reduction in the consumption of fossil fuel but also demonstrating the productive uses of renewable energy through improved value added products, better services and improved income. The underlying reasons for this development scenario are based on the fact that for RE to take off in the PICs, it must have the confidence and the approval rating of the decision makers, donors, investors, the private sector and the general public first. This will largely be achieved by having more financially sustainable and economically competitive RE-based energy system installations, which people can witness. PIGGAREP is therefore designed to complement other parallel RE projects that in removing barriers to widespread RE applications that are financially sustainable and economically competitive. From the findings and recommendations of the project development exercise that was carried out under PIREP, the following alternative scenario outcomes that will be facilitated by the proposed regional RE project are expected:
- a. Improved productive uses of RE particularly in the rural and remote communities for use in schools, health centres, water supply, agriculture and fishery, telecommunication, etc.
 - b. Improved local expertise, experiences and skills to: (1) Monitor and analyse RE resources measurements and data; (2) Plan, design, install, monitor and maintain RE installations; (3) Formulate and review legislation, regulations and policies; and, (4) Effectively campaign, lobby for and disseminate RE success stories;
 - c. Availability of legal, financial, technical advice and equipment support for RE-based energy system projects in the PICs;
 - d. Enhanced understanding of the mitigation of GHG emissions through the application of RE technologies for supporting the sustainable development efforts of the PICs;
 - e. Strengthened legal and regulatory, planning and coordination structures for the mitigation of GHG through the widespread utilization of RE;
 - f. Enhanced understanding of the RE potentials, and knowledge about the, RE resource availability in the PICs;

- g. Identified financially viable and ‘bankable’ climate change mitigation and RE projects and identified number of RETs deployment for productive purposes that are sustainable and competitive with fossil fuel based alternatives;
- h. Implemented financially sustainable RE demonstration projects that successfully showcase the design, development, engineering, financing, implementation, operation, maintenance, monitoring and evaluation of RE-based energy system projects that can support the sustainable development of the PICs; and,
- i. Established sustainable capital base for supporting RE-based energy system (electricity and non-electricity) projects in the region.

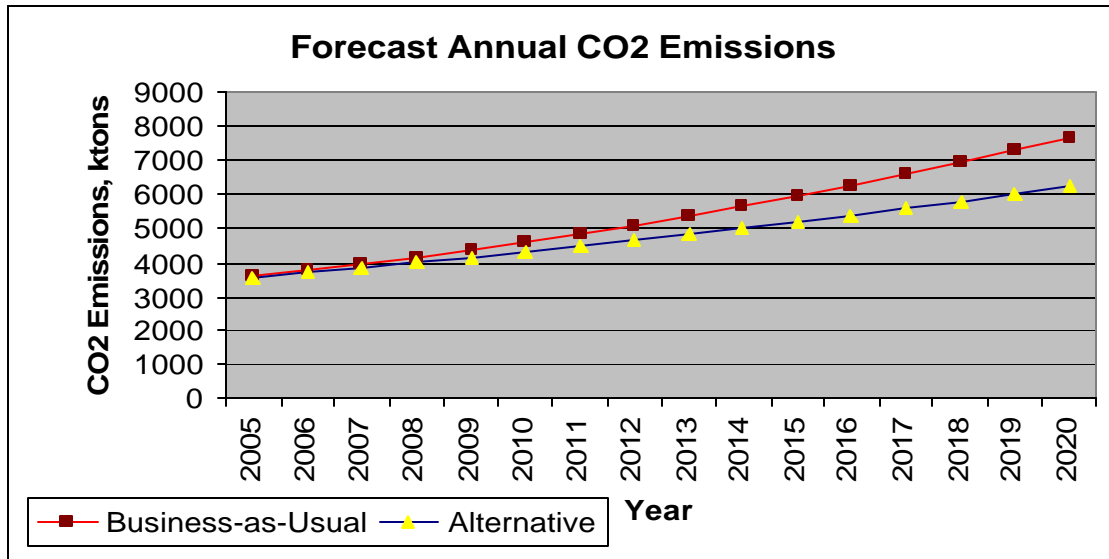


Fig 1: Forecast Annual CO2 Emissions (Baseline and Alternative Scenarios)

- 41. Based on historical data on diesel fuel oil (DFO) consumption in the PICs, the annual CO2 emissions in region would increase from about 3.62 million tons in 2005 to about 7.66 million in 2020 (Fig. 1). New RET-based energy system installations in the PICs in the next 15 years is expected to result in an average 1.3% reduction in annual growth of CO2 emissions (e.g., 3.59 million in 2005 and 6.24 million in 2020).
- 42. Comparing the trends of potential CO2 emissions from DFO consumption in the PICs (business-as-usual and alternative scenarios), the potential annual CO2 emissions reduction from RET applications in the Pacific could be from about 0.04 million tons in 2005 to about 1.41million tons in 2020. As can be seen in Fig. 2, by 2020, the total cumulative potential CO2 emissions reduction is about 9.41 million tons.
- 43. The PIGGAREP is intended to facilitate the deployment of sustainable and economically viable and competitive RET-based energy systems. The potential CO2 emission reduction is estimated to be about 2.0 million tons. Annex G presents the CO2 emissions reduction (direct, direct post project and indirect) that can be realized from PIGGAREP.
- 44. Specifically the following are expected at the end (unless specified otherwise) of the proposed 5-year regional RE project:

- a. Successfully established and operational RE demonstration projects showcasing productive uses of renewable energy in community infrastructures as well as the business angle of RE applications in each PIC;
- b. At least one RESCO each is registered and fully operational in at least 10 PICs;
- c. At least one RE project designed, implemented, operated and managed by local RE experts in each PIC;
- d. At least 20,000 additional people in PICs served with RE;
- e. At least 20 additional social services (schools, health centres, telecommunication, etc) in PICs using RE;
- f. At least an average total of US\$5 million income generating opportunities in the region gained from RE
- g. All PICs have Climate Change/Environment and Energy Acts and Policies in place and enforced;
- h. All PICs have set GHG emissions reduction and/or RE utilization targets;
- i. At least 20 additional PIC nationals with a university degree on the technical aspects of RE;
- j. At least 20 commercially viable RE projects in the region have been identified, studied and prepared for donors, financiers and investors;
- k. Comprehensive documentation of the technical, economic and environmental characteristics of 14 successful demonstration projects and accessible via internet-based information system;
- l. National energy balance of each PIC prepared based on the energy supply and consumption data that will be collected to assist in formulation of the national energy plans and policies;
- m. Updated regional synthesis of the energy sector GHG emission inventory;
- n. At least 100 MW of additional RE installed capacity, approximately equivalent to at least US\$100 million invested in new RE installations;
- o. A Regional RE Fund with an initial start up capital of US\$10 million is studied and considered by the PICs and donors to provide loans for RE applications; and,
- p. At least a total of 2 million tons of CO₂ mitigated by 2015.

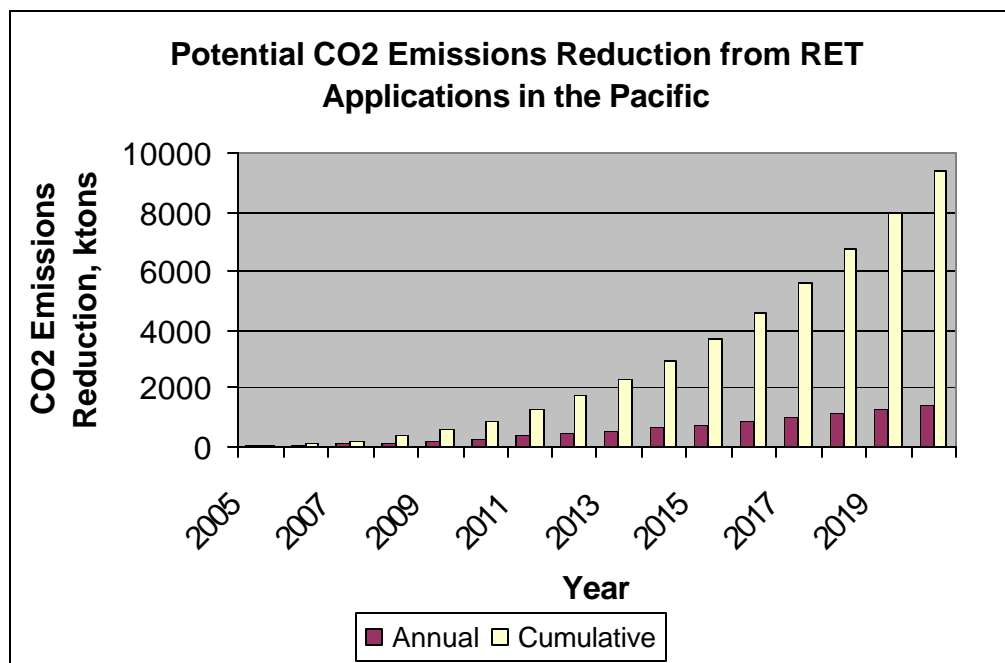


Fig. 2: Potential CO2 Emissions Reduction from RET Applications in the PICs

RATIONALE AND PROJECT OBJECTIVES

RATIONALE

45. The fact that the PICs are small in size, situated in the Tropics, along the Pacific Rim of Fire and surrounded by the vastest ocean on Earth makes the PICs just about the region with the highest RE potential per capita. Studies carried out during the project preparatory exercise (i.e. PIREP) indicated that the PICs could reduce the CO₂ emission from the BAU by at least 2 million tons by utilising feasible RE technologies. However this potential cannot be fully realised unless barriers identified during the preparatory phase are removed.
46. The proposed regional project is the first attempt in the PICs to comprehensively address the inter-related barriers to the widespread utilisation of feasible RE technologies. It is a collective attempt to address the technical, financial, market, institutional, policy and awareness barriers at the same time since they are interrelated and intertwined. The PICs are well aware of the fact that the combined effect of such barriers is the absence of financially sustainable and economically competitive RET-based energy system projects on the ground. Earlier efforts in the region to promote RETs have only partially tried to address 2 to 3 barriers and have had minimal impacts that could change the business-as-usual scenario in the field of RE in the Pacific. Since the technical barriers are related to the market barriers and the policy barriers are related to the financial, market and technical barriers, the removal of barriers through this comprehensive approach will have more impacts and can significantly change the status quo in RE development and utilization in the PICs.

BENEFITS OF THE PROJECT

Global and Regional Benefits

47. The successful implementation of the PIGGAREP is estimated to reduce CO₂ emissions by at least 2 million tons by 2015.
48. In addition, such achievement will strengthen PICs'/Alliance of Small Islands States' (AOSIS) negotiation positions at the UNFCCC and Kyoto processes and it will also demonstrate the strong commitment of the PICs to the Johannesburg Renewable Energy Coalition (JREC) of which the AOSIS is a founding member. Further it will meet the region's commitment to the International Action Programme on RE that was adopted of the International RE Conference held in Bonn in June 2004, the Johannesburg Plan of Implementation, the BPoA and the Mauritius Strategy, as well as supporting their effort to achieve the MDGs and to comply with the Contonou Agreement.
49. The experiences from the project will provide lessons and best practices for other SIDS. The project will also strengthen the collaborative effort by international and regional agencies to address the multi-dimensional nature of the challenges of climate change.

National Benefits

50. There are many national benefits to be gained from the productive uses of renewable energy, which will result from this project. The key ones include:

- a. Increased investments and employment opportunities - The project will create an enabling environment with the necessary confidence and there will be increased investments in a vibrant RE market. Such investments will not only create more employment opportunities (through RESCOs, manufacturing, marketing, etc) but it will also trigger improved local know how, awareness and experiences.
- b. Improved livelihoods and increased income generation in rural areas – Productive uses of RE will bring about income generation opportunities for people in rural areas, whereby the mechanical and/or electrical energy produced from RE resources is/are utilized for income generating activities, e.g., cottage industries, metal works, agro-industrial processing, etc.
- c. Improved access to electricity and the delivery of public services - A number of PICs have less than 20% of their population with access to electricity. The project will not only provide electricity to project sites but it will also create the enabling environment and confidence for major electrification programme. Access to electricity will increase with the resultant improvement in the socio-economic conditions, particularly in rural and remote areas including improved education, health, telecommunication and water supply.
- d. Good governance - The project will promote good governance through the adoption of legislative, regulatory and planning tools which will promote open competition and transparency, open and consultative processes among local stakeholders, equal participation of men and women and the respect for the local environment. In some PICs, the absence of an effective regulatory framework for the power sector have led to increases in the power tariff, which consumers claim to be unjustified and unfair.
- e. Self-sufficiency - The effort of this project to promote the widespread utilisation of RE resources through activities implemented mostly and jointly with local experts means more reliance on indigenous resources, with its associated foreign exchange savings, increased energy independence and building of local expertise.

PROJECT GOALS AND OBJECTIVES

Project Goal

51. The global environment and development objective of the project is the reduction of the growth rate of GHG emissions from fossil fuel use in the PICs through the removal of the barriers to the widespread and cost effective use of feasible RE technologies.
52. At the end of a five-year project life it is expected that GHG emissions in PICs will be reduced by at least 2 million tons by 2015 in comparison with the BAU scenario. In 2015, the potentials of available and feasible RE resources in the PICs would have also been comprehensively assessed, developed and used effectively for both electricity and non-electricity applications.

Project Objectives

53. The specific objectives of the project is the promotion of the productive use of RE to reduce GHG emission by removing the major barriers to the widespread and cost-effective use of feasible RE technologies (RETs). The removal of the barriers will enable feasible RETs to be used in tourism facilities, educational, communication and health services, to provide

employment to young people and to establish value added activities like handcraft making. It will also improve the local access to financing for renewable energy projects. These will be carried out through: (a) Increased number of successful commercial RE applications; (b) Expansion of the market for RET applications; (c) Enhanced institutional capacity to design and implement RE; (d) Availability and accessibility of sufficient funding for existing and new projects; (e) Strengthened legal and regulatory structures in the energy and environmental sectors; and, (f) Improved awareness and knowledge among key stakeholders.

54. The project is comprised of six major components, each addressing a specific type of barriers.

Type of Barriers	Project Component Objectives
Technical	Increased number of successful commercial RE applications for productive uses and income activities in the PICs
Market	Expansion of the market for RET applications for both energy and non-energy uses
Institutional	Enhanced institutional capacity to design and implement RE
Financial	Availability and accessibility of sufficient funding for existing and new RE projects
Policy and Regulatory	Strengthened legal and regulatory structures in the energy and environmental sectors
Information and Awareness	Improved awareness and knowledge among key stakeholders project

PROJECT STRATEGY

55. The overall strategy for implementing the PIGGAREP is based on the fact that for the BAU scenario to change, politicians, senior government officials, the civil society and the general public must hear, touch, see and read about sustainable RE projects on the ground and these projects are actually reducing the consumption of fossil fuel at the project sites. The project will therefore focus on a balanced mix of activities on the ground, particularly in demonstration sites in each PIC, and delivered through hands-on involvement of national stakeholders and experts and with the support of regional and international stakeholders and experts. The following strategies will be applied in the project:

- a. Promote hands-on project management and participation by national experts at the national level and promote closer cooperation and coordination by national stakeholders, with the regional stakeholders providing backstopping services if needed;
- b. Promote regional cooperation and intensify multi-donor and agencies cooperation;
- c. Encourage an operational focus of the project on concrete and tangible RET demonstration projects through the supply of services and support to the designated projects;
- d. Mobilize and develop regional and national capacities for mainstreaming of RE investments;
- e. Systematically generate 'bankable' project pipelines in the participating countries;
- f. Enhance knowledge management and networking nationally, regionally and internationally on RE development and utilization;
- g. Delivery of a comprehensive package of training, technical advice and support, public awareness improvement, legislations and policies, RE resources monitoring, feasibility studies and RE system hardware installations; and

- h. Identification and facilitation of the deployment of the realistic number of RET-based energy system installations, which are commercially competitive with alternative sources of fossil fuel energy
56. The perceived high risks to the region of promoting feasible RETs, limited successful applications on the ground coupled with the high transaction costs associated with supporting RE investments within the currently undeveloped market will continue to cause local lending institutions to pursue other opportunities and agendas. Without the GEF's involvement, the BAU scenario would only lead to minor progress in RE development and meaningful market-based investments on RE will remain suppressed, as the basic problems that have impeded RE investments in the past remain unsolved.

PROJECT COMPONENTS, ACTIVITIES AND EXPECTED RESULTS

Project Components and Activities

57. The following are the six (6) major components of the proposed regional RE project, each addressing a major type of barrier to RE development and application in the PICs.

Component 1. RE Technical Capacity Building & Technology Support Program

Component 2. RE Market Development Program

Component 3. RE Institutional Strengthening Program

Component 4. RE Financial Support Program

Component 5. RE Policy and Regulatory Support Program

Component 6. RE Information and Awareness Enhancement Program

58. **Component 1: Technical Capacity Building & Technology Support** - This component will deal with the lack of successful commercial installations on the ground, the lack of awareness as to the available RE resources in the PICs and the absence of technical standards as a guide for RE equipments and their installations. It will consist of three sub-components: (1) RE Resources Assessments; (2) Technical Support; and, (3) RE Demonstration Schemes

A. Regional RE Resource Assessment – The activities under this sub-component will assist PICs to gain a better understanding of their RE resource potentials. The limited RE resource assessments under PIREP produced general desk study estimates of the RE resource potentials. These proposed resource assessments would not only be to evaluate RE resources of the PICs, in general, but also evaluate potential project sites. Results of the specific assessments will be used to complete project designs and the feasibility studies to identify 'bankable' projects. This activity will involve the active participation of the national meteorology, hydrology and geology offices, which will be represented in the country teams.

- 1) *Development of a RE Resource Assessment Methodology* - A RE resource assessment methodology, tailor-made for the PICs, will be developed and used in conjunction with the RE resource assessments and RE resource database development. Training on the application of the methodology is included under this activity.
- 2) *Conduct of RE Resource Survey* - This activity will involve the conduct of surveys of the potential RE resources in the different PICs. Detailed assessments will be carried out to

determine the technical requirements of the applicable and feasible RET applications that were identified during PIREP.

- Production of a Pacific Wind and Solar Maps/Atlas - This will involve the extension of prior wind resource monitoring that have been carried out in the Cook Islands, Fiji, Niue, Tonga and Vanuatu at potential promising sites in these and other PICs which would then enable the production of a wind map / atlas for the participating PICs. While solar is not as site-specific as wind, its monitoring can be carried out at the same sites for minimal extra costs. Solar monitoring will also be conducted in PICs without the wind potential, particularly those sites which are very close to the Equator.
 - Biomass resource assessment - Biomass resources assessment studies will be conducted in PICs with estimated large-scale resource base. An emphasis will be placed on assessing the bio-fuel potential particularly from copra oil.
 - Geothermal resource assessment - This will involve the extension, resources permitting, of prior geothermal resources monitoring that have been carried out in Fiji, PNG, Samoa, the Solomon Is and Vanuatu.
 - Hydro resource assessment - This will involve supporting the completion of preliminary studies that have been carried out in PNG and Vanuatu. It will also support the conduct of fresh studies in new sites particularly in Fiji, PNG, Samoa, Solomon Is and Vanuatu where the resources exist.
- 3) *Design and Development of a Regional RE Resource Database* - A regional database for RE resources in each PIC will be designed and developed under this activity. Inputs will come from the individual RE resource assessments that will be carried out in each PIC. The database will include various modules for the data storage, data analysis/assessment, and information on RE resource quantities and potentials as well as of applicable RETs. The regional database will be housed and operated and maintained and shared with project stakeholders. This activity will also include training on the operation and maintenance of the database.
- 4) *Development of a RE Monitoring and Simulation Methodology* - A computerized simulation program will be developed to be used in evaluating and predicting trends/patterns and characteristics of the RE resources availability and potentials in the different PICs.
- 5) *Conduct of Capacity Building Program on RE Resource Assessment* – This will involve the conduct of training courses on RE resource assessments for the technical personnel of relevant government agencies particularly the energy and meteorology offices.
- B. Technical Support – This sub-component will include activities that would build capacity of the PICs in the various technical aspects of RE applications, including development in each PIC of local RE services industry, local RE system equipment and/or components manufacturing and supply industry, R&D and RE system equipment and/or components standards development and implementation. This activity will involve the active participation of local technical institutes, private sector contractors, consultants, manufacturers and suppliers as well as related government agencies.
- 1) *Evaluation of the Viability and Requirements for the Development of Local RE Service Industry* – This will involve the assessment of the feasibility of developing a consultancy

and engineering service industry in the PICs that can provide technical and maintenance services for RE-based energy systems.

- 2) *Conduct of Training Course on the Design, Feasibility Evaluation, Operation and Maintenance of RE Systems (electricity and non-electricity)* - This capacity building activity will involve the provision of comprehensive training courses on high efficiency design, economic feasibility evaluation, operation and maintenance of RE-based energy systems for potential local engineering consultants and RE system equipment suppliers.
 - 3) *Assessment of Other Value-Added Applications of RE Resources* – This will involve the evaluation of the feasibility and applicability of other uses of the RE resources in each PIC. It will also involve the evaluation of the relative economics among RE resources which are available to meet a particular productive application of RE, like in a case where both solar and micro-hydro are both available to power small-scale food processing units. Individual evaluation reports and project recommendations for each potential use of RE resources will be prepared. Results will also be uploaded to the regional RE database.
 - 4) *RE System Utilization Best Practices (electricity and non-electricity)* - This activity is designed to evaluate the present operating performance of existing RE system installations in the PICs and in other SIDS. This activity will result in the delivery of useful inputs in the design of new RE systems or expansion, as well as identify potential improvements in the operation of existing RE systems in relevant sectors of the national economy. Moreover, this activity will also consolidate current best practices in the utilization of RE and application of RE technologies. The Tafa'ingata waste-to-energy demonstration project in Samoa will receive special attention in this activity.
 - 5) *RE System Equipment Standards Setting* – This will involve the development of appropriate performance (energy and quality) norms/standards for major RE system equipment such as the balance of system (BOS) of solar PV systems, biomass-based power generation equipment, wind turbine system components, and micro-hydro components. A consolidation of equipment performance and contractual standards based on relevant codes/standards in other countries and information that will be gathered from local RE industry consultations will be carried out. The developed norms/standards, which will be regional in context, will be proposed for consideration to PIC governments. Technical support from the project will be provided if necessary, in government deliberations concerning the modification of the regional norms/standards on the specification and performance of RE system equipment/components as applied in a specific PIC.
 - 6) *Design and Initiation of a Sustainable RE System R&D Program* - This activity will involve the design and development of sustainable RE R&D program supported initially by the PIC governments and later also by the private sector. The R&D efforts may focus on the following areas: (1) Enhanced resource assessment methodologies; (2) Improved field assessments, including load forecasting, socio-economic, and environmental surveys; (3) RE system equipment and/or component standards; and, (4) Improved models for RE Hybrid system models tailored for the PICs.
- C. RE Demonstration Projects - This component will focus on new, existing and soon-to-be implemented RE-based energy system projects in the PICs and will involve the active

participation of the host communities to showcase the business angle of RE applications, the demonstration of the design, development, engineering, financing, implementation, and commercial operation and maintenance of RE-based energy system projects. Having successful RE demonstration projects on the ground will improve the private sector/investor confidence on RET application projects.

1) *Techno-economic Feasibility Analyses of Potential RE-based Energy Systems Projects* – This activity will involve a techno-economic feasibility analysis and prioritisation of potential RE-based energy system projects in the PICs, including those that could be showcased in the replication of the demonstration projects that will be included under this component of the regional RE project.

2) *Identification and Evaluation of RET Application Demonstration Requirements* – In this activity, the selection of the demonstration sites will be finalized. Inasmuch as bulk of the demonstration activities are actually parallel projects that are subsumed into PIGGAREP, there may be some requirements that need to be made in order for these projects to be more in-line with the barrier removal objective of the PIGGAREP. As mentioned earlier, the demonstration projects are also among the means to remove the barriers to the widespread application of RETs in the region. These are meant to showcase and demonstrate the design, development, engineering, financing, operation, maintenance, monitoring and evaluation of sustainable and commercially viable RE-based energy system projects. The “business angle” of such projects will be demonstrated. The delivery mechanism of these parallel projects may need to be changed/modified to facilitate the barrier removal aims, i.e., the demonstration objectives. The following are some of the possible demonstration projects:

- Mangaia wind power project (Cook Is)
- Pukapuka PV project (Cook Is)
- Naroi PV project (Fiji)
- Vanuabalavu and Welagi bio-fuel generation project (Fiji)
- EU-funded outer islands electrification project (Kiribati)
- Institutional woodstove project (Kiribati)
- Makefu PV Water Pumping Project (Niue)
- China-funded wind power project at Waigani (PNG)
- Milne Bay small hydro power projects (PNG)
- Solomon Is Village Electrification Council’s micro hydro projects (Solomon Is)
- Tafaingata waste-to-energy project (Samoa)
- Electric Power Corporation’s hydropower programme (Samoa)
- APACE solar PV project (Solomon Is)
- Ha’apai Solar Electricity Project (Tonga)
- Vava’u solar electricity project (Tonga)
- Nukulaelae PV project (Tuvalu)
- JICA PV projects (Vanuatu)
- Torba Province solar electrification for schools and health centres (Vanuatu)

An evaluation of the implementation requirements (e.g., logistical, financial, manpower, technical, legal, etc.) for the demonstration projects that will be implemented under this component of the regional project will also be carried out.

- 3) *Courses of Actions for the Removal of Barriers to the Successful Implementation of RE Demonstration Projects* - Certain requirements maybe required to facilitate the smooth and effective implementation of the demonstration projects. Among these is the verification and confirmation of the magnitude and availability of RE resources at the sites and perhaps some legal requirements such as power purchase agreements, fuel supply agreements. In addition, technical assistance will be provided in the setting up of administration, operation and maintenance systems at the demonstration sites (e.g., designation of administrator, caretakers/operators; establishing of guidelines and procedures).
- 4) *Establishment of Baseline Data for the RE Demonstration Sites* - This activity will involve the conduct of electricity consumption and demand surveys, as well as socio-economic conditions at the demonstration project sites and baseline performance data. Operating performance targets for the planned projects will also be established.
- 5) *Design of RE Demonstration Projects* - This activity will involve the provision of technical assistance in the preparation of the new demo project basic engineering designs, comprehensive technical, and economic and social feasibility evaluations.
- 6) *Implementation of new RE Demonstration Projects* – The host demo sites will carry out the *tasks* involved under this major activity which will also include the inclusion of appropriate energy efficiency measures in both the supply and consumption of RE-based energy sources. Technical assistance will be provided, where necessary, in the engineering design, installation, and commissioning of the facilities.
- 7) *Monitoring and Evaluation of both new and existing RE Demonstration Projects* – The operation of the demonstration projects will be monitored (by operators) under this activity. Each project will be evaluated as to their maintenance, management, administrative organization and stakeholder participation in the operation. The evaluation will include the energy and environmental impacts of the project. An evaluation report for each demonstration project highlighting the operating and economic performances, as well as identifying energy efficiency opportunities, energy savings and GHG emissions reduction will be prepared. This activity will be carried out regularly even after the completion of this project.

Activities c.5 – c.7 will focus on new hardware demonstration projects, which will come online during the life of the project. These hardware projects will not be funded by the PIGGAREP but are expected to become among the demonstration activities the project. They include:

- Fiji Electricity Authority’s wind power project (Fiji)
- Solar electrification project at Christmas Is (Kiribati)
- Grid-connected wind power project (Niue)
- Bogo/Kawa micro hydro project (PNG)
- Extension of the Afulilo hydro project (Samoa)
- Niufo’ou solar electrification project (Tonga)
- Tuvalu restructuring of its solar electrific ation programme (Tuvalu)
- Maewo rural development hydroelectric project (Vanuatu)

- 8) *Evaluation and Dissemination of the Results of the Demonstration Program* - This activity will entail the conduct of an overall performance evaluation of the demonstration program, including the dissemination of program results and recommendations in each PIC through a national workshop.
- 9) *Design of Sustainable Replication and Follow-up Program for RE Development* - This activity will involve the design of a sustainable replication and follow-up program for financially supporting the development and utilization of RE resources for electricity and non-electricity purposes in each PIC.

National, Regional and Joint National-Regional Activities

The abovementioned activities will be carried out in each PIC, depending on the specific technical barriers that are prevalent in each PIC, and the specific demonstration project that will be carried out (See Annex I). There are also activities addressing the common technical barriers that will be carried out regionally, and activities that will be implemented both at the national and regional levels.

- 1) National Activities: Based on the national RE assessments findings, the project proponents and stakeholders view that the cost-effective means of addressing major technical barriers would be through the provision of much-needed capacity building and technical support for PIC energy offices, public utilities, private sector entities that are working (or are interested in working) in the energy sector, and rural folks in: (a) ascertaining the extent/magnitude of potential RE resources; (b) evaluating the viability and requirements for the development of local RE service industry; (c) design, feasibility evaluation, operation and maintenance of RE Systems (*electricity and non-electricity*); (d) assessing other value-added applications of RE resources; (e) best practices in RE system utilization (electricity and non-electricity); (f) designing and implementing sustainable RE system R&D programs; (g) designing, implementing, monitoring and evaluating RE demonstration projects (*each showcasing commercially feasible RE delivery mechanisms*); and, (h) designing sustainable follow-up program for RE development. The specific national activities that will be carried out in each PIC will be based on the findings and recommendations of the national RE assessment reports and primarily the existing situation in the area of RE development and utilization in the PICs.
- 2) Regional Activities: In addressing the common technical barriers among the PICs, the proposed project will involve activities that will: (a) develop a RE resource assessment methodology; (b) design and develop a Regional RE Resource Database; and, (c) develop a RE monitoring and simulation methodology. It should be noted that PIREP came up only with very basic qualitative assessments of the RE resources in each PIC.
- 3) Joint National and Regional Activities: To support the implementation of national technical capacity building activities, the project will also carry out the following: (a) Specific RE Resource Assessments (*Production of a Pacific Wind and Solar Maps/Atlas; Biomass resource assessment; Geothermal resource assessment; and, Hydro resource assessment*); and, (b) RE System Equipment Standards Setting.

59. **Component 2: RE Market Development** - This major component of the project addresses the barriers to the development of a market for RE products and services, both nationally and regionally. It gives a special emphasis to the creation of an enabling environment for the private sector, as a key driver of RE in the PICs. It will involve the following activities:

A. Supporting of Investment Project Development - In this activity, the energy offices, national planning offices and the private sector in the PICs will be provided assistance in expanding RE development efforts. Feasibility studies of RE-based energy system projects in the PICs will be carried out, and proposals will be prepared for “bankable” projects covering project set-up, cost-benefit analysis and financial plan. These proposals will be presented to interested investors (local, regional and international) and international donors. A pipeline of such projects will be developed and this will also be the basis for the development of appropriate financing tools. Below are the general categories of projects that can be studied and developed. The pipeline projects are expected to enhance the demand for RET applications both for electricity and non-electricity purposes in the PICs.

- 100% Reliance on RE Projects – Among the projects that will be evaluated is the planned 100% RE Islands in Niue, which will assess the practicality and economics of making Niue fully dependent on RE
- Waste-to-Energy Projects - Feasibility study of an energy production using waste in an attempt to address waste disposal, which is a fast growing environmental problem in the PICs. This will make use of the experience from the Tafa’ingata demonstration project in Samoa.
- Productive Uses of RE - Feasibility studies on projects addressing the business angle of RE service deliveries for income generation/livelihood support, water supply, health services, education, women and youth welfare.

It will be ensured that the pipeline of “bankable” RE projects will consist only of socially-accepted, and environmentally sound RET applications, with considerable number of those with emphasis on enhanced utilization of RE for productive uses and income generation. Such pipeline of projects is expected to align the interest of local beneficiaries with that of the national government and private sector in each PIC.

B. Assessment of Local Capabilities for RE Services - This activity is aimed mainly at the private sector and will involve the evaluation of the capabilities of local firms (e.g., work shops, industrial manufacturing) in each PIC in performing technical and maintenance services for RE-based energy systems. It will also include capacity building for local engineering consultants in providing efficient services on RET. Such industry in each PIC is expected to develop and provide the technical services associated with the design, installation, and maintenance and troubleshooting of RE-based energy systems.

C. Assessment of the Viability of Local Manufacturing of RE System Equipment and/or Components - This is another activity that is targeted to the private sector and will involve the evaluation of the feasibility of, and requirements for developing an industry/business for the local manufacture of RE-based system equipment and/or components in each PIC. Assessment reports highlighting findings and recommendations will be prepared.

- D. Introduction of a “One-Stop-Shop” Service for RE Market Services – This activity will involve the design and implementation of a RE “one-stop-shop” service for prospective RE project developers and implementers in the PICs. The concept, which has been successfully introduced and used in other developing countries, is aimed at assisting prospective RE project developers in the development and implementation of RE-based energy system projects. It can for example assist in expediting processing and implementation of RE projects. This is to address the sometimes long-winded process of applying for permits to develop and implement RE projects, which usually demotivate prospective project developers. All required requirements could be facilitated in such service. In some countries, the services also include project feasibility analysis, design, and other related technical assistance. The service will become part of the regular work of the energy offices and could evolve into something that will also cover services for all other energy activities in each PIC. The project will provide capacity building for the personnel providing the RE “one-stop-shop” service. Where feasible, particularly in high potential PICs (e.g., Fiji, PNG), the project will help a self-sustaining RE market service centre that will be responsible for the delivery of RE “one-stop-shop” services.
- E. Training Course on RE Projects and RE-based Livelihood/Productivity Projects Financing – This activity will involve the conduct of training courses on project financing for: (1) private and government financial institutions; (2) commercial banks; and, (3) private entrepreneurs.
- F. Technical Assistance on Livelihood Support - This activity will entail the provision of technical assistance in the establishment of income generation activities and productive use projects in rural areas served by RE-based energy systems. Assistance will be provided to communities and/or prospective RE project developers/owners/operators, and for private entrepreneurs (individual or group) that are interested in investing in livelihood support and productive use projects in rural areas utilizing RE resources. The tasks that will be carried out under this activity will include reviewing the latest international literature and experience on productive uses of RE, assessment of potential community/beneficiary cost sharing in RE-based energy projects, and provision of technical assistance in the design of appropriate financing schemes for off-grid RE projects based on government grants, local cost sharing and loans from financial intermediaries (banks, NGOs, cooperatives, etc.), including the identification and assessment of sources of finance, tariff structures and fiscal aspects.
- G. Design and Adoption of Model Fiscal Incentives for RE Investments – This will involve the conceptualisation, evaluation, development, and enforcement of appropriate fiscal incentives that would contribute to a favourable enabling environment for RE investments. Assistance will be provided in encouraging the promotion of such incentives to PIC governments for them to accept and enforce them.
- H. Promotion of Bulk RE System Equipment/Component Purchasing - This activity involves the design and piloting of the implementation of bulk purchasing agreements between RE project developers (government/private sector) and manufacturers and/or importers/suppliers of RE system equipment/components. Bulk purchasing, as a market aggregation activity is intended to provide consumer with better quality products, efficient delivery and lower first cost. Appropriate bulk purchasing agreements for each PIC (or where more advantageous - for a group of PICs) will be developed and implemented. The impacts of this market aggregation activity will be monitored and evaluated. Results of the exercise will be disseminated to the relevant government offices in the PICs as well as other buyer groups.

- I. Development and Promotion of ESCO-led RE System Projects - This activity is also aimed at the private sector and will build on RESCO projects in the PICs (e.g., Fiji, Kiribati and Tonga) and in other developing countries focusing on the design and implementation of appropriate model energy performance contracts: (1) Between the project owner and the RESCO; and, (2) Between the RESCO and a banking/financing institution. The latter can be used by banking/financing institutions in the PICs in extending loans for energy performance contracting and promotion of RESCO transaction. This activity will be supplemented with capacity building for PIC governments and power utilities RESCO operations, financing, developing of measurement and verification procedures.
- J. Establishment of Market for RESCO Services – This activity will involve promotion of partnerships among private sector stakeholders like RESCOs and engineering companies, construction firms, and/or finance companies in PICs. Qualified RESCOs will be promoted to banking/financing institutions and prospective RE project developers/owners.

National, Regional and Joint National-Regional Activities

The abovementioned activities will be carried out in each PIC, depending on the specific market development barriers that are prevalent in each PIC, and the specific demonstration project that will be carried out (See Annex I). There are also activities that will be implemented both at the national and regional levels.

- 1) National Activities: As per recommendations of the national assessment reports from each PIC, the proposed project will address the market-related barriers in the PICs by providing technical assistance in: (a) formulating plans for RE-based energy system projects; (b) assessment of capabilities for existing local RE services; (c) Assessing the viability of local manufacturing of RE system equipment and/or components; (d) introducing to energy offices some sort of “One-Stop-Shop” assistance for RE market services; (e) training relevant stakeholders on RE projects and RE-based livelihood/productivity projects financing; (f) Developing and Promoting ESCO-led RE System Projects; and, (g) establishing market for RESCO services. The specific national activities that will be carried out in each PIC will be based on the existing RE market situation in the PICs.
 - 2) Joint National & Regional Activities: A number of specific activities were identified to support the market barriers removal activities in each PIC. These are: (a) Design and Adoption of Model Fiscal Incentives for RE Investments; and, (b) Promotion of Bulk RE System Equipment and/or Component Purchasing.
60. **Component 3: RE Institutional Strengthening** - This component of the project will address the institutional issues regarding the development and implementation of RE initiatives in the PICs that have persisted for at least the past 3 decades.
- A. Strengthening of Energy Offices in PICs – This activity will entail the provision of institutional capacity building to EO personnel, and assisting in the establishment of appropriate staff levels and sufficient resources for effective energy programs.
 - B. Establishment of RE Policy Committees – This will be carried out at 2 levels: national and regional. It will involve the creation of a national committee in each PIC, whose members

represent the various key stakeholders/players in the area of RE in the country, that will regularly coordinate and report on RE policy issues related broadly to policies within the country's energy, industry and financial sectors. This national committee will also monitor impacts of policy implementations and coordinate the revision/improvement of policies as necessary in accordance with the RE goals/objectives of the country.

At the regional level, the same type of committee will be established, but comprised of representatives from the relevant regional organizations that are involved in energy, in general, and RE, in particular. The committee could well be the existing Project Advisory Committee (PAC) for the preparatory phase (i.e. PIREP). It will monitor impacts of policy implementations at the regional level and coordinate the revision and/or improvement of policies as necessary in accordance with the collective RE goals/objectives of the PICs.

- C. Conduct of a Detailed Study on Energy Supply and Consumption in the Pacific – The ability of PICs to formulate meaningful energy plans and policies have been largely hampered by the absence of accurate and reliable data. Annex J provides a clear picture of the levels and quality of energy data gathering and energy policy making in the PICs. This activity will be carried out at the national and regional levels and will support policy related activities under the project's Institutional Strengthening and Policy and Regulatory Support component. At the national level, a survey of energy supply and consumption in the various sectors of each PIC will be carried out. An initial detailed evaluation report on the energy supply and end-use consumption in each PIC, including energy demand and energy trends/profiles will be prepared. In each PIC, the initial energy balance will be prepared, which the Energy Office will update/revise regularly even after the project. The national energy balance can also be used in coming up with national energy sector GHG emissions inventories, which can be used in the preparations of climate change policies and plans, thereby maximizing the benefits to the PICs from the exercise. At the regional level, the project will come up with the regional energy balance, based on the national energy balance of each PIC.
- D. Conduct of Integrated Energy Planning – This activity will enhance support to RE development efforts of the PICs through capacity building in the area of integrated energy planning. A review of the energy planning methods used by the PICs will be carried out and recommendations for integrating existing development policies/plans (e.g., technological, social and economic) as well as plans/programs in various sectors related to RE development and commercialisation will be provided. Evaluation and enhancement of existing planning models and forecasting tools will be made to facilitate integrated planning. Existing database, reports and policy documents on the energy development, including rural electrification, will be updated. Least cost planning, using appropriate software, geographical information systems, energy and socio-economic statistics, aerial maps and meteorological data will be carried out. The national energy plan (inclusive of RE) of each PIC will be prepared.
- E. Development of a RE Planning Model – This activity will involve the design and development of a model for RE planning tailor made for the PICs. It will involve, where applicable, the upgrade of existing RE planning models used in the region. As per findings from the national RE assessments under the PIREP, the modelling activity will include RE project analysis as well as improve rural electrification policy. Moreover, in conjunction with the market development objectives of the project, this activity will seek to balance out the need for a comprehensive census of village-level information with the practical needs of private entrepreneurs who may be interested in pursuing RE-based power generation.

National, Regional and Joint National-Regional Activities

The abovementioned activities will be carried out in each PIC, depending on the specific institutional barriers that are prevalent in each PIC, and the specific demonstration project that will be carried out (See Annex I). There are also activities addressing the common institutional barriers that will be carried out regionally, and activities that will be implemented both at the national and regional levels.

- a) National Activities: The envisioned activities to address the institutional barriers to widespread applications of RETs in the PICs are: (a) Strengthening of energy offices in the PICs; and, (b) Capacity building on, and conduct of, integrated energy planning. The specific national activities that will be carried out in each PIC will be based on the existing institutional capacity in the PICs.
- b) Regional Activities: In addressing the common institutional barriers among the PICs, the PIGGAREP will involve activities that will come up with a Regional RE Policy Committee (as proposed by the PICs); and the development of a RE Planning Model
- c) Joint National & Regional Activities: To support the implementation of the institutional capacity building activities in the PICs, the project will also carry out a detailed study on energy supply and consumption in the Pacific.

61. **Component 4: RE Financial Support** - This component of the project will address the financial barriers to the widespread application of RETs in the PICs, and will involve several activities that are aimed at confirming the investment requirements of applicable RETs for specific productive use applications and at specific sites and increasing the access to financing for RE projects and community-based projects that are supported by RE. This component will draw on the experiences with the Kaupule Trust Fund (Tuvalu), the Sustainable Development Fund (PNG) and the recently launched Venture Capital Fund (Samoa).

- A. RE Business Financing Capacity Building - This activity will be focused on local banking and financing institutions in each PIC to improve their understanding and appreciation of the economic and financial benefits of RE system initiatives. Specially designed training courses will be catered to financial institutions to teach them how to evaluate RE system project proposals (technical and economic/financial feasibility, including risk analysis and management) and help them develop their RE system project portfolio.
- B. Assistance for Accessing Local Financing in PICs – In-line with the previous activity, technical assistance will be provided to interested local banking/financing institutions in the PICs in the development of simplified and user-friendly guidelines for the utilization of their existing credit facilities that can be used for financing RE-based energy system projects.
- C. Establishment of RE Financing Facility in PICs – Based on the findings under the PIREP, the establishment of a financing facility for supporting RE-based energy system projects, as well as livelihood support and productive use projects in selected PICs served by such systems will be facilitated under this activity. Such fund shall be an expansion of an existing credit facility in the PIC (public and/or private). The proposed alternative financing facility will

comprise of the funds in the existing credit facility and incremental funds for lending to RE-based energy projects.

- D. Design and Implementation of Smart RE Financing Scheme in PICs – In this activity, a suitable and sustainable smart financing scheme that will be used for lending funds from the established RE financing facility in each PIC will be designed and implemented. The design will be based on the review of existing financing schemes in the PIC and in the other PICs, as well as other SIDS, as well as the latest international literature and experience on financial mechanisms for RE-based energy system projects. All feasible modalities for the lending will be evaluated, and an appropriate scheme will be selected and implemented. The design of the appropriate scheme will involve, among others the definition of the loan terms, loan repayment, borrower eligibility criteria, and fund management arrangements. A possible modality is for the RE financing facility to finance loans only for RE system equipment purchase. The borrower gets the equipment instead of the loan money to buy the equipment, and pays the loan at the agreed terms. The fund manager makes the necessary arrangements for the supply of the equipment with local and/or foreign RE equipment suppliers. This second option will help support the development of a RE system equipment market in the PIC. After getting the approval of the Finance authorities of the PIC government, the financing scheme is implemented.
- E. Service Provision to RE Financing Applicants - This activity will entail the provision of assistance to entities that will be eligible for accessing the RE fund in relevant PICs. The national teams in the PICs where the RE financing schemes will be implemented will be providing this assistance (e.g., project financial feasibility evaluation, processing of financing applications, etc.). Such assistance will also be extended to the procurement (if needed by demo host sites) of required hardware for the demonstration schemes that will be implemented under this project.
- F. Evaluation of the RE Financing Assistance Program - The evaluation of the impacts of the RE financing schemes and the provision of recommended revisions (if necessary) to the relevant policy and implementation guidelines that affects the RE financing assistance will be carried out under this activity.
- G. Financing Schemes Review - This activity entails the evaluation of the impacts of the financing schemes that were implemented in the project, and the provision of recommended revisions (if necessary) to the relevant policy and implementation guidelines that affects the proposed financing schemes.
- H. Sustainable Follow-up Program Design - This activity will involve the design of a sustainable follow-up program for financially supporting RE utilization (where applicable) in the various sectors of the national economy in each PIC. Another follow-up activity is the establishments of a Regional RE Fund. Such fund will address the provision of financing for RE-based energy system projects (electricity and non-electricity) in the Pacific region, targeting in particular those PICs where the operation of country-based RE financing facilities is not economically feasible. It will entail the design and development of a regional RE fund with seed funding coming from bilateral donor organizations, private banking and financing institutions. It will consist of several sub-accounts catering to the various financing requirements of prospective applicants. This activity will involve the mobilization of private sector investments in RE development and utilization.

National, Regional and Joint National-Regional Activities

The abovementioned activities will be carried out in each PIC, depending on the specific financial barriers that are prevalent in each PIC, and the specific demonstration project that will be carried out (See Annex I). There are also activities that will be implemented both at the national and regional levels.

- 1) National Activities: Based on the findings from previous studies in the region, the proposed project is envisioned to carry out interventions for addressing the identified financial barriers to RET applications in the PICs, which include: (a) capacity building on RE business financing; (b) provision of assistance for accessing local financing for RE-based energy projects; (c) establishment of RE financing facilities; and, (d) design and implementation of smart RE financing schemes. The specific national activities that will be carried out in each PIC will be based on the type and magnitude of financing barriers in the PICs.
- 2) Joint National & Regional Activities: To support the implementation of interventions that are intended to address the financial barriers, the project will come up with the design of sustainable follow-up programs, such as the feasibility of establishing a Regional RE Fund and leave it for a post PIGGAREP initiative to pick up and implement if the concept is viable. Such fund would most likely be an expansion of existing regional funds like those administered by the Forum Secretariat.

62. **Component 5: RE Policy and Regulatory Support** - This project component will build on whatever existing policies of the PIC governments regarding RE development and utilization have at the moment. It aims to remove the policy and regulatory barriers that have persisted since the 70s despite abundant experience/lessons learned from previous projects. Previous efforts to incorporate lessons learned from previous policy making exercises failed to bring about changes in the type of policies and the kind of policy enforcements that would have bring about a conducive climate for RE in the Pacific region.

- A. Formulation and Implementation of National Energy Policy – In this activity, technical advice will be provided in the review of existing RE-related policies and regulations in each PIC (as well as those from other SIDS). The project will provide technical assistance to PIC energy offices in the formulation of appropriate policies on RE resource development and utilization. The technical assistance extends to the development and facilitation of the enforcement of the implementing rules and guidelines for the RE policies and regulations.
- B. Conduct of RE Promotion Workshops - This activity will involve the conduct of annual national workshops on RE promotion focusing on the relevant policies, policy instruments, policy support activities, RE regulations and the associated implementing rules and guidelines. The workshop will also come up with the coordination mechanism among the stakeholders in each PIC (particularly those in the National RE Policy Committee).
- C. Policy Reviews on RE Applications in PICs – This activity will involve the conduct and facilitation of the implementation of the relevant policy recommendations that were preliminarily identified under PIREP. Such policies are meant to bring about the enabling environment that will be supportive of RE applications in the PICs.

- 1) *RE Policy Analyses* - This will involve the provision of technical advice in the review of existing RE-related policies and regulations in each PIC, as well as those from other SIDS, regarding energy resource development and utilization, with the aim at promoting and supporting RE. It will also evaluate possible policy support activities and strategies that can be considered for RE system project developers/investors.
 - 2) *RE Electricity Policy Study* - This study will be conducted early in the project to facilitate the verification and confirmation of the economic competitiveness of RETs against fossil fuel-based energy technologies. It will involve the evaluation and formulation of policies and regulations on the production and sales of RE electricity in the PICs, along with the policy support activities.
 - 3) *RE Electricity Pricing Study* – Similar to the RE Electricity Policy Study, this will also be conducted early in the project for use in the verification and confirmation of the economic competitiveness of RETs against fossil fuel-based energy technologies. It will involve the conduct of an electricity tariff pricing study for electricity generated using RE. It will further investigate and evaluate various options for financial incentives to encourage RE-based power projects, including capacity and energy payment and investment incentives. After evaluating each option, this activity will propose specific recommendations for the levels of each incentive measure. A model for electricity pricing with environmental impact costing will also be developed.
 - 4) *Study on RE-based Livelihood and Productivity Projects Support Policy* – This study will determine and evaluate the potential livelihood support and productivity projects that will utilize electricity from RE-based energy projects. Policy recommendations for the granting of appropriate incentives for such projects will also be formulated.
- D. Evaluation of the National Energy Policy Implementation - The impacts of the enforcement of policy; pricing and regulatory measures that are recommended and implemented in order to promote the application of RETs particularly for electrification will be monitored and evaluated. Lessons learned around issues such as incentive mechanisms, further barriers to RET applications, communication and policy strategies will be identified and appropriate actions recommended.
- E. Conduct of RE Policy Review- The RE policy will be reviewed and evaluated based on the results of the demonstration scheme. Revised policy and implementing guidelines covering pricing, incentives, etc. about RE-based off-, and on-grid, power generation will be formulated and recommended for issuance and enforcement.
- F. Legislation on RE System Equipment/Components Standards – In conjunction with the activity on the setting-up of RE system equipment/components standards, this activity will involve the provision of technical assistance in the establishment of the regulations concerning the enforcement of such standards in the PICs. This would also include the setting up of the implementing rules and guidelines, and the facilitation of the enactment of the regulation.

National, Regional and Joint National-Regional Activities

The abovementioned activities will be carried out in each PIC, depending on the specific policy and regulatory barriers that are prevalent in each PIC, and the specific demonstration project that will be carried out (See Annex I). There are also activities that will be implemented both at the national and regional levels.

- 1) National Activities: Based on the findings from the national RE assessments that were carried out under PIREP, the project will address the identified policy and regulatory barriers to RE development and utilization in the PICs through activities that will involve: (a) formulation and implementation of National Energy Policy; (b) policy reviews on RE applications (e.g., *RE Policy Analyses*; *RE Electricity Policy Study*; *RE Electricity Pricing Study*; and, *Study on RE-based Livelihood and Productivity Projects Support Policy*); and, (c) review of environment legislations relating to RE. The specific national activities that will be carried out in each PIC will be based on the type and magnitude of policy/regulatory barriers in the PICs.
 - 2) Joint National & Regional Activities: To support the implementation of interventions that are intended to address the policy/regulatory issues on the use of RETs, the proposed project will carry out activities related to establishment of legislation on RE system equipment and/or components standards.
63. **Components 6: RE Information and Awareness Enhancement** - This project component will address the information barriers that hinder the widespread development and implementation of RE system (electricity and non-electricity) projects in the PICs. These include technical information that are required in the conceptualisation / design of potential RE projects, and market information that are necessary in evaluating the economic/financial viability of RE projects (e.g., electricity prices, fuel prices, electricity demand). Due to the diverse geography as well as varying regional economic conditions in the Pacific, RE information availability, accessibility and affordability are big issues that affect RE development in the different PICs.
- A. Establishment of a RE Information Centres – This activity will involve the establishment of a RE Information Centre (or a small unit in the energy office) in PICs to cater for the information needs of the citizenry regarding energy, in general, and RE, in particular. The regional RE Information Centre, which will be housed at SPREP, which is also in-charge of the operation and maintenance of the regional RE database, will coordinate with the local RE information centres for the data updates from the PICs.
 - B. Establishment and Implementation of an Integrated RE Information Exchange Service – This activity will be implemented to obtain and share information on RETs within and from outside the country. The information exchange service, which will continue even after the completion of this project, will involve publication of a newsletter containing information circulated through the information exchange service (local/ regional), dissemination of lessons learned and best practices from RET application projects, monitoring of all RET application projects in each PIC and preparation and updating of profiles of these facilities, and abstracting of relevant articles from scientific and engineering journals on RET.
 - C. RE Advocacy and Promotion – This activity will involve the development and implementation of outreach and promotion using appropriate communication mechanisms for target markets in each PIC (e.g., print media, conferences and site visits) to: (1) Potential users such as off-grid communities, local government units, private entrepreneurs; (2) Potential RE project proponents such as financiers, technology distributors, NGOs; and, (3) Policy decision-makers in legislative positions.

- D. Information Campaigns on RE Technology (RET) Applications in PICs – This activity will involve the publication and dissemination of printed information materials on RETs, and the production and airing of multi-media campaign materials on RET applications. A RE product exhibition fair will also be organized and conducted in selected PICs (particularly those with high market potentials) to showcase RET system equipment and components.
- E. RE Website Development – This activity will involve the setting up of a website that will be used to supplement RE promotion activities and will have access to relevant databases in the PICs and in the Pacific. This activity will be coordinated by the regional RE Information Centre.
- F. Design and Conduct of a RE Technology Education Program - This will consist of 2 groups of educational activities: (1) In-house training course on RETs for energy office staff members and local engineering firms; and, (2) Graduate training on specific aspects of RE. The first group of activities is aimed at enhancing the capacity of energy offices and the local RE service industry. The second group seeks to support a PIC national from each PIC to study for a first degree in the technical and engineering aspects of RE. This will provide opportunities for PIC nationals to conduct research work in RE fields of interest and relevance to the region. These educational activities, particularly the first group, are expected to continue even after the completion of the project.
- G. Design and Implementation of RE Training Program – This will include both in-country and foreign-implemented training and continuing education activities. The specific activities listed below are based on the capacity enhancement needs identified in PIREP and are considered vital to the success of the envisioned outcomes in the field of RE in the PICs. Subsequent program review, assessment and planning may identify new activities and training areas, which the sector needs.

RE Training Module: Regional/International

Training Activities	Duration	Target Participants	Number of Participants
Study Tour on RE Policy Initiatives in SIDS	10 days	Energy Office, Energy companies, NGO Rep, Private Sector Rep	14
Technician Trainers' Training on RE Systems	10 days	Power utility, energy companies, engineering consulting firms, NGOs	700
Training on Rural Electrification Planning Model	10 days	Energy Office, power utilities, energy companies, NGOs	700
Training on RE Electricity Pricing	5 days	Power utility, Energy Office	42
Training on RE Project Financing	5 days	Energy Office, Financing Institutions and Private Investors	84
Training on RE Power Purchase Contracting and Negotiations	5 days	Energy Office, Financing Institutions and Private Investors	84
Training on Facilitation and Consensus Building	5 days	Energy Office, power utilities, energy companies, NGOs	84
Training on RE Legislations and Enforcement	5 days	Energy Office, power utilities, energy companies, NGOs	84

RE Training Module: In-Country

Training Activities	Duration	Target Participants	Number of Participants
Training on Basic Concepts on Rural Energy Services	5 days	Power utilities, local government units, communities, Rural Banks/ Micro-credit Enterprises	3 Training Courses @ 30 Participants/ Course
Training on RE Project Management	5 days	Power utilities, local government units, communities	3 Training Courses @ 30 Participants/ Course
Renewable Energy Technicians' Training	10 days	Power utilities, local government units, communities	3 Training Courses @ 30 Participants/ Course
Training on Renewable Energy Project Appraisal for Rural Financial Institutions	5 days	Rural Banks, Micro-credit enterprises	3 Training Courses @ 30 Participants/ Course
Rural RE Entrepreneurial Training	5 days	Power utilities, local government units, communities, NGOs/CBOs	3 Training Courses @ 30 Participants/ Course
RE System Design, Operation and Maintenance	5 days	Engineering and Energy Consulting Firms, RE technicians and installers	3 Training Courses @ 30 Participants/ Course

Emphasis is given to the need to conduct regional RE training for technician's since it has been highlighted in many RE projects in the past, particularly those which involved the installation and operation of RE system hardware, that poor maintenance and lack of knowledge to operate and maintain such systems are among the main causes of the failure of such projects. Such training courses will not only cover the fundamentals of RE but will focus substantially on the operation, maintenance and troubleshooting of RE systems.

H. Regional RE Awards Program - This is intended as a promotional activity to encourage utilization of RE in relevant industries, as well as prospective RE system developers and operators in the PICs. It will involve the design of a rating scheme that would be based, among others, on the magnitude of realizing the RE potentials in each PIC. This activity will involve also the development of the implementing guidelines, rules and regulations, as well as the initiation of the first awards ceremony.

National, Regional and Joint National-Regional Activities

The abovementioned activities will be carried out in each PIC, depending on the specific information barriers that are prevalent in each PIC, and the specific demonstration project that will be carried out (See Annex I). There are also activities addressing the common information barriers that will be carried out regionally, and activities that will be implemented both at the national and regional levels.

- 1) National Activities: From results of previous studies and experiences in the promotion of RE in the PICs, the proposed project is designed to implement activities that will involve: (a) RE advocacy and promotion; (b) information campaigns on RET applications; (c) design and conduct of a RET Education Program; and, (d) launching of National RE Awards Program.

The specific national activities that will be carried out in each PIC will be based on the current level of awareness and the information needs in the PICs.

- 2) Regional Activities: As a means to further enhance interest and awareness in the development and utilization of RE in the region, the proposed project will design and initiate a Regional RE Awards Program.
 - 3) Joint National & Regional Activities: To support the implementation of the national RE information and awareness enhancement activities, the proposed project will also carry out activities that will involve: (1) establishment of RE information centres; (2) establishment and implementation of an integrated RE information exchange service; (3) implementation of an energy monitoring & consumption program; (4) development of a RE website; and (5) design and implementation of RE training program (*Regional/International and In-Country Training Courses*)
64. It should be noted that the PIGGAREP is the first attempt to comprehensively address RE in each PIC, apart from the ongoing Fiji: RESCO project. The proposed project activities will mostly be at the country level and specifically on the needs of each PIC to ensure maximum local participation, particularly of the private sector, NGOs/CBOs and civil servants, and more importantly the local communities in rural areas that are primary beneficiaries of RE-based energy projects. The project will be comprised of a package of “on-the-ground” demonstrations of RET applications (both for electricity and non-electricity uses), and several capacity building and technical assistance activities that are necessary for the removal of barriers to widespread RET application in the PICs. Some of these capacity building activities have been carried out in varying degrees in earlier RE initiatives in the region but these are considered by the PICs as very crucial if RE is to make a difference in the PICs.

Expected Results

65. The expected outcomes as described in the GEF Alternative Scenario are anticipated by end of the proposed 5-year regional RE project. The interventions that will be carried out under the project, and the systems and the enabling environment that the PIGGAREP will create, are expected to facilitate the widespread development of the PICs’ RE resources and the application of RETs to support the achievement of their respective national development objectives. By 2015, it is anticipated that there will be:
- a. A total cumulative CO₂ emissions reduction of at least 2 million tons.
 - b. At least 100 MW of additional RE installed capacity or at least US\$100 million invested in new RE installations;
 - c. At least a total of US\$ 5 million worth of income generating opportunities in the region gained from increased employment, trade and improved productivity facilitated by RE.

PROJECT RISKS AND SUSTAINABILITY

RISKS

66. **General Risks**: Overall risk for the project is considered moderate. The principal risks relate to: (i) the sustainability of the support by key stakeholders in the region; (ii) lack of interest of the

private sector and (iii) the price level for conventional energy i.e. world market development for fossil fuels. Experience in the region has shown that the risk of lacking or fading government support in the field of RE, energy policy and energy sector related institutional development is real, i.e., the project has to establish effective means to monitor these risks. Mitigation measures include a strong emphasis on PIC hands-on project management and participation, mobilizing private sector participation and a continuous dialogue between the project's donors, executing agency, implementing agency, regional organizations and national governments.

Summary List of Project Risks

Risk	Level of Risk	Commentary and Mitigating Actions
<p>Ineffective local participation and coordination The capacity in the PICs to effectively coordinate and implement major regional projects is low. At times, the available local capacity is fully absorbed on an aid-funded project thereby diverting attention from higher priority activities.</p>	Low to Moderate	<p>Dedicated project personnel assure efficiency of implementing project activities. Project will fund the salaries of National Project Coordinators, which governments will absorb into its service at the end of the project.</p> <p>Local authorities should play the lead role in the management of the implementation of their respective project activities.</p>
<p>Ineffective regional coordination Regional organizations continues to carry out energy-related activities in the PICs on their own losing the potentials for synergetic work towards wider achievement of energy-related objectives</p>	Low to Moderate	Regular meetings of the Project Advisory Committee (PAC) to exchange work programmes and implementation plans.
<p>Failures of the Demonstration Projects A failure of the demonstration projects will essentially mean a return to the BAU scenario with the lack of investor and donor confidence to finance more hardware installations and the RREF.</p>	Low to Moderate	The package of capacity building and enabling environment activities, centred on each demonstration project, over a period of 5 years with the regular monitoring and progress reporting will ensure the success of these projects.
<p>Market/Economic External Risks A drop in fossil fuel prices makes RE less attractive to RESCOs and investors.</p>	Low	A significant fall in fossil fuel prices is highly unlikely given that at mid -2004 oil prices reached an all time high. A drop in oil prices will not change the environmental attractiveness of the demonstration projects.
OVERALL RISK		LOW TO MODERATE

SUSTAINABILITY

67. Institutional Sustainability - The sustainability of the institutional elements of the project is assured through the adoption of approaches and strategies that seek to foster and reinforce the long-term sustainability of existing institutional and coordination structures that have been established and are operational at both the national and regional levels with regards to projects dealing with dealing with cross-sectoral subjects like oceans, climate change, renewable energy, water, etc.
68. At the national level, there is the Country Team Approach. This approach, established during the PICCAP and continued in PIREP as well as in PIEPSAP, is based on the realisation that to

effectively tackle climate change issues there is a need to bring together many actors from different crosscutting thematic areas. It involves inviting the national government to designate an agency to host a team of sectoral representatives and national experts, which could facilitate policy and decision-making, and the implementation of climate change-related projects and issues. During the project development stage (under PIREP), PICs were required to form PIREP Country Teams with, as a minimum, a senior officer from the PIC's Energy Unit/Office, the PICCAP Coordinator and a senior environment officer. Some PICs wanted to stay with their Climate Change country teams, which already have adequate energy sector representatives. Others opted to form a PIREP Team as a working group and reporting to the Climate Change Team. During the project, the country team will be trained, supported financially and technically and made responsible for coordinating, implementing and managing in-country activities.

69. At the regional level, there is the Working Groups Approach. This is a coordinating mechanism where regional intergovernmental organisations and other related regional and international agencies in the Pacific come together to ensure complementarities of their efforts, particularly in cross-cutting subjects like climate change, energy, oceans, etc. There is an Energy Working Group (EWG) and a Climate Change Working Group with just about the same memberships. All members of the EWG are represented in the Project Advisory Committee (PAC) of the preparatory phase. The PAC will be strengthened to meet more regularly and to participate in the implementation of the relevant national and regional project activities. As a minimum, the PAC will meet at least twice a year preferably in May/June, allowing for the stakeholders to agree on a coordinated annual project implementation plan before endorsement at the Annual Meetings of the collaborating implementing agencies.
70. The entire process will be supported by UNDP-GEF providing technical, financial and administrative assistance to the entire process as needed. Institutional sustainability is also ensured by the multi stakeholder participation of leading climate change and energy agencies at both the national and regional levels.
71. The energy office in each PIC, which will play a significant role in the implementation of the national activities under PIGGAREP, will continue to spearhead and sustain the activities after the project life. The national activities of the regional project will be anchored with the energy office's energy program in the next 10 years. The proposed project will strengthen the role of the energy offices in leading the energy programs and GHG emission mitigation activities in each PIC as well as fostering continuous and closer productive working relationships with the environment departments. The institutionalised periodic monitoring and reporting of energy supply and consumption in the PICs, as well as the continuous monitoring and evaluation of the RE project sites, even after completion of the project period, will bring sustainability of the project with desired benefits in the long run. The financing mechanisms that will be designed and implemented under the project are meant to ensure sustained financing assistance for establishments that are planning to implement RE-based projects, both for electricity and non-electricity applications. Auxiliary activities (such as RE business financing capacity building, promotion of ESCO-led RE system projects, promotion of an RE services industry, and establishment of market for ESCO services) will ensure sustainability of the relevant interventions that will be implemented under PIGGAREP.
72. Sustainability of the Regional RE Market - The financial sustainability of the project's efforts will essentially depend on the competitiveness of RE versus conventional fossil alternatives. More specifically:

- a. While the development of the fossil fuel price benchmark is difficult if not impossible to predict over a 5 years project lifetime and beyond. It is safe to assume that specific cost for RE hardware will decrease as international markets expand and technologies advance. It should be noted, that specific investment cost for wind energy, for example, have decreased in real terms by approx 30% over the last ten years with industry analysts predicting further decreases in the coming decade. Similar developments are expected for biofuels and PV.
- b. As the project aims at pooling projects and increase the size of the currently very small RE market in PICs it is reasonable to expect decreases in on site specific investment cost through lower transaction cost and improved implementation efficiency following a learning curve.
- c. The project will address the issue of ensuring a comprehensive analysis of cost related to both conventional and RE based energy supply in the framework of its capacity and policy development components, i.e., it is expected that the perception of competitiveness of RE amongst decision makers will change as the full lifecycle cost of conventional supply chains become known.

73. Replicability and long-term Prospects - The use of a balanced mix of capacity building and enabling environment activities by the project tailored to the specific country conditions, markets and regulatory environment, and RET application demonstrations on the ground are ingredients for successful RE resource utilization. This is expected to be the vehicle for shifting investment patterns from conventional technologies toward RE. The activities that will be carried out under the project are meant to create an enabling environment that would facilitate the widespread utilization of RETs in the PICs by enhancing productive uses of RE and the increased access to local financing. With such enabling environment, replications of several specific interventions that will be carried out in the project are expected. In particular, the various demonstration activities that will be carried out are meant to showcase feasible design and application of RET systems, design and manufacturing of RE system equipment and/or components, utilization of RE system design tools and models, enforcement of policies, and implementation of RE project financing. Replication is an integral component of the project design as the expected energy savings from the application of RETs (and the corresponding GHG emissions reduction) somehow rely on the replication of the various PIGGAREP activities.

74. Replicability of the proposed project components will be ensured through the documentation and widespread dissemination of the package of activities/inputs that went into each demonstration project. Successful replication of market-based solutions to RE development can also be extended across sectors and transferred from household supply concepts to education, health, water and food supply and communication.

STAKEHOLDER PARTICIPATION AND IMPLEMENTATION ARRANGEMENTS

STAKEHOLDERS PARTICIPATION AND ROLES

75. Widespread stakeholder consultations have been carried out during the preparatory phase of the project (i.e. PIREP). During the inception of the preparatory phase, a regional consultative and planning meeting was held with the project stakeholders to agree on its implementation plan and budget.
76. In order to ensure broad stakeholder involvement at national scale consultations were held during the country missions of the consultants responsible for the drafting of the 15 national RE

assessment and regional synthesis reports. During these missions, consultations were held with national representatives from implicated government agencies, public utilities, private sector organizations, regional organisations and the civil society. The consultations also included national SWOT workshops for consensus building.

77. Regional stakeholders were regularly informed on the progress of the preparatory phase through meetings of the Forum Officials Committee, CROP, the PAC, CROP EWG and the Donors' Renewable Energy Roundtable. National stakeholders were regularly informed through direct communications between the Chief Technical Adviser (CTA) and the PIREP National Coordinators, meetings of the PIREP Country Teams, regional workshops and meetings and the MSP multipartite review meeting.
78. In the preparation of the project, national and regional stakeholders participated in a logical framework analysis workshop, which came up with the project-planning matrix. The meetings of the Forum Leaders and Heads of CROP agencies were informed of the development of the project. The annual conference of the Pacific Power Association (PPA) was consulted on the design of the project. The 15th SPREP Meeting, composed of mostly GEF Focal Points in the PICs approved the extension of the preparatory phase to the PIGGAREP and SPREP's continuing project executing agency responsibilities.
79. The barriers to RE development and application in the PICs cannot be removed without a high degree of participation from all stakeholders listed above. With stakeholder participation, RE will receive wide recognition and support. The major project stakeholders and their overall roles are described below:
 - a. Pacific Island Country Governments and the Country Teams – The PIC governments and the country teams will take a direct lead role in the management; coordination and implementation of all project activities in their respective countries and will provide logistical support to the project. Staff from the national energy department/ministry in the government will be seconded to the project, along with material support such as office space, use of equipment and transportation. The PIC government shall also play a key role in implementation of the training and public awareness components of the project.
 - b. NGO and Local Community – A key NGO or local, community-based organization will be identified to assist primarily in the design and development of public awareness and productive-use components of the project. The NGO or local group will provide input in assessing the awareness level and attitude towards electrification and new and RE in particular to determine the type(s) of public awareness campaign to be developed. They will also assist in identifying the types of productive-use projects to undertake and the appropriate group or organization to undertake the project.
 - c. Private Sector – The private sector will be involved in the project as consultants and suppliers and installers of RE system hardware installations.
 - d. Banks and Financing Institutions – Banks and financial institutions will provide loans to local RE production, supply, contracting businesses and RESCOs. They are also expected to play a major role in the management of the RREF, subject to the outcome of the feasibility studies and the relevant consultation meetings.

- e. International and Regional Organizations - The PICs are fully aware of their limited resources and expertise and have therefore established regional organizations such as, Pacific Islands Forum Secretariat, PPA, SOPAC, SPC, SPREP and the USP to facilitate regionalism, in terms of common approaches, cost effectiveness, and complementarity of efforts. These organizations will be involved through SPREP to provide backstopping services to the PICs in the execution of the PIGGAREP activities.

Summary List of Stakeholders and Key Roles in the PIGGAREP

Stakeholder	Key Role in the PIGGAREP
UNDP SAMOA COUNTRY OFFICE	<ul style="list-style-type: none"> Provide GEF Implementing Agency oversight on the project implementation (e.g. financial and substantial oversight, monitoring, evaluation, administrative backstopping, coordination with other UNDP initiatives, etc)
SPREP	<ul style="list-style-type: none"> Executing Agency as per standard UNDP/GEF rules and procedures under the National Execution (NEX) modality (e.g. responsible for the planning and overall management of project activities, reporting, accounting, monitoring and evaluation, supervision of contractors, management and audit of UNDP resources, etc) Linkage with co-financing activities Linking of the project to other climate change related activities in the PICs (e.g., Second National Communications, the Climate Change Framework, UNFCCC, Kyoto Protocol, Climate Change Legislations and Policies, Climate Resource Monitoring through the PICGOS; Information dissemination through the <i>Pacific Environment Information Network (PEIN)</i>³ and the Pacific SIDSNet website) Manage all project consultancies and contracts
PIREP Country Teams	<ul style="list-style-type: none"> Implementation of in-country training and awareness activities Coordination of the implementation of activities delivered by consultants and external agencies Report on co-financing activities to SPREP
SOPAC	<ul style="list-style-type: none"> Energy Legislation and Policies activities Training and Technical Advice and Support Resources Assessment Information dissemination through the <i>Pacific Energy Newsletter</i>
USP	<ul style="list-style-type: none"> Training Activities
Greenpeace	<ul style="list-style-type: none"> 100% RE islands study in Niue. Information dissemination, awareness raising, working with key governments and lobbying for Pacific interests at international meetings.
World Wildlife Fund	<ul style="list-style-type: none"> Information dissemination through the <i>South Pacific Currents</i>
Private Sector/Consultants	<ul style="list-style-type: none"> Conduct some of the resource monitoring activities and feasibility studies Installations of the hardware projects
Banks and Financing Institutions	<ul style="list-style-type: none"> Represented in the PAC Financial support to RE development activities Possible management partners of the RREF
Pacific Power Association	<ul style="list-style-type: none"> Information dissemination through the Pacific Power Magazine Interface between the PIGGAREP and the power utilities

³ PEIN is the 2004 winner of the prestigious Stockholm Challenge Award, which is an international competition that each year looks for new models for the information society of tomorrow. The Pacific Islands Environment Network (PEIN) provides access to PICs to 20,000 volumes of on-line environmental-related information, across 14 Pacific island countries.

IMPLEMENTATION ARRANGEMENTS

80. The PIGGAREP is a continuation of the GEF, UNDP, SPREP and PICs collaboration on strengthening the capacity of PICs to deal with the challenges of climate change initiated through the PICCAP and the PIREP. As such, the key implementing and coordination arrangements (Country Teams and a regional Project Advisory Committee) will be maintained to sustain the momentum and synergies created over almost ten years of effort.
81. The execution of the project activities will be based on the “Country Team Approach”, which was slightly modified and maintained by the preparatory phase (i.e. PIREP). SPREP will execute the project based on the bigger picture of climate change in the PICs particularly in relation to the PICs negotiation positions and reporting obligations under the UNFCCC and the Kyoto Protocol.
82. While the project is a regional one because of the costs, coordination, replication, sustainability and backstopping benefits, the proposed project activities will mostly be conducted at the national level, delivering on-the-ground activities and specifically on the needs of each PIC, focusing on hardware projects on the ground, utilizing local experts and involving local communities. This is to ensure maximum impacts and visibility. It will also give PICs the ownership of the project, maximum local participation, particularly of the private sector, NGOs/CBOs and civil servants, and more importantly the local communities in rural areas that are primary beneficiaries of RE-based energy projects. This arrangement will strengthen the “country team approach” which is pivotal to the success of the project. Country teams may subcontract certain activities to regional and international expertise where necessary. The Country Teams established during the preparatory phase and the appointed National Coordinators, which PICs have reported to be very effective in creating a closer working relationships among climate change/environment and energy officials, will be maintained.

In-Country Activities

83. National government professionals and other relevant national stakeholders from the private sector and civil society will, to the extent possible, manage, coordinate and implement the in-country activities. The County Teams will be provided (upon request) external technical assistance via the PM for implementation of specific in-country activities.
84. Relevant regional organisations, national consultants, regional consultants or international consultants, in that order of priority, can provide this expertise. Relevant in-country and regional activities will be subcontracted to and executed by the appropriate regional organisations with the expertise and time on a costs reimbursement basis only and provided those activities are not already funded as co-financing activities. Regional organisations, which have the comparative advantage vis-à-vis the activities, will be designated as the sub-contractor for those activities. The PM will coordinate the outputs from all the project activities, including the co-financing activities.
85. Working in conjunction with the various project partners, UNDP-Samoa, as the implementing agency, will be responsible for monitoring and evaluation (M&E), including organising project reviews, approving annual implementation work plans and budget revisions, monitoring progress, identifying problems, suggesting actions to improve project performance, facilitating timely delivery of project inputs, and provide linkages to its other regional and global initiatives. All M&E functions will be carried out in line with standard UNDP and UNDP-GEF procedures.

Project Advisory Committee (PAC)

86. The coordination of regional activities through the PAC and the Donors' Renewable Energy Roundtable process, both established under the preparatory phase, will be maintained. However, the membership in the PAC will be enlarged to include representatives of more PICs, more civil society representatives, donors and sponsors of co-financing activities. As a minimum, the PAC will meet at least twice a year, allowing for the stakeholders to agree on a coordinated annual project implementation plan before endorsement at the annual Multipartite Review meeting.
87. The PAC will support and guide the PM by providing expertise and knowledge. Each PAC committee member will be a Regional Coordinator and will be responsible for the coordination of project activities and activities of the organisations he/she represents to avoid duplication of effort. The PAC will also ensure that the project activities are fully in line with existing energy and climate change policies and priorities in the region. On request from the PM, the PAC will provide guidance on the execution of project activities.

Project Executing Agency

88. SPREP, which on behalf of its member countries is the project proponent of PIGGAREP, will be the executing agency. SPREP is the inter-governmental organisation in the Pacific that has the regional mandate for climate change interventions and therefore house the only regional Climate Change, Climate Variability and Sea Level Rise Programme among CROP agencies. One of the key outcomes of this programme is "*Alternative energy technologies and systems that are adequate, affordable, efficient and environmentally sound, in particular RE resources, developed and used.*" The programme has inter-related activities and expertise on policy and legislations, international climate change negotiations, tropical climate meteorology, adaptation and vulnerability assessments, GHG inventory and mitigation, RE, energy policy and legislation and ozone depleting substances. SPREP executed the PICCAP and the preparatory phase PIREP, which is now extended by the PIGGAREP. In addition, SPREP is the regional focal point to the UNFCCC. It is critical to execute the PIGGAREP with the bigger picture of CC in mind and how the outputs from the project will relate to the PICs' obligations and positions under the UNFCCC and Kyoto Protocol – two key global instruments, which SPREP coordinate for the region.
89. SPREP's CC programme has, in a period of almost ten years, put in place the "Country Team approach" – a functioning, cross-sectoral and coordination mechanism for CC under the Departments of Environment (the SPREP Focal and GEF Operational Focal points). The same approach has been inherited by the preparatory phase which was praised by the PICs as responsible for creating effective and closer working relationships among national stakeholders. At the regional level, SPREP is driving the CC Roundtable process that it started in 2000. PIREP has established a PAC set-up comprising of the CROP EWG members, NGOs and 2 PICs representatives. It has established a Renewable Energy Roundtable process with the donors. The PAC and the Donor Roundtable process are both functioning very well enabling closer collaboration between PIREP's and those of other agencies and donors. In addition, SPREP has also created synergies with many other related initiatives (see pages 12-14), including the GEF-funded Fiji Renewable Energy Hybrid Power Systems, the GEF-funded Caribbean Renewable Energy Development Programme, the Johannesburg Renewable Energy Coalition and the International Action Programme adopted at the June 2004 Bonn Conference on renewable energies.

90. SPREP has more than 10 years experience as GEF executing agency on several major regional based environment-related projects in the PICs. PICCAP, as mentioned earlier, was a US\$3.5 million project covering 10 PICs. Furthermore, SPREP has been executing agency for the South Pacific Biodiversity Conversation Programme (SPBCP). SPBCP was a US\$10 million project covering 13 PICs. SPREP is currently the designated executing agency for the Strategic Action Programme (SAP) for the International Waters of the Pacific Small Island Developing States. SAP is a US\$ 12 million project covering all 14 PICs. SPREP was the designate executing agency for the preparatory phase (PIREP). At the multipartite review of the preparatory phase, PICs and regional stakeholders expressed their satisfaction and appreciation of SPREP's professional execution of the PIREP. SPREP has thus substantial proven and satisfactory record and experience with major GEF funded environment and climate change-related projects from a regional execution modality.

Project Management Office

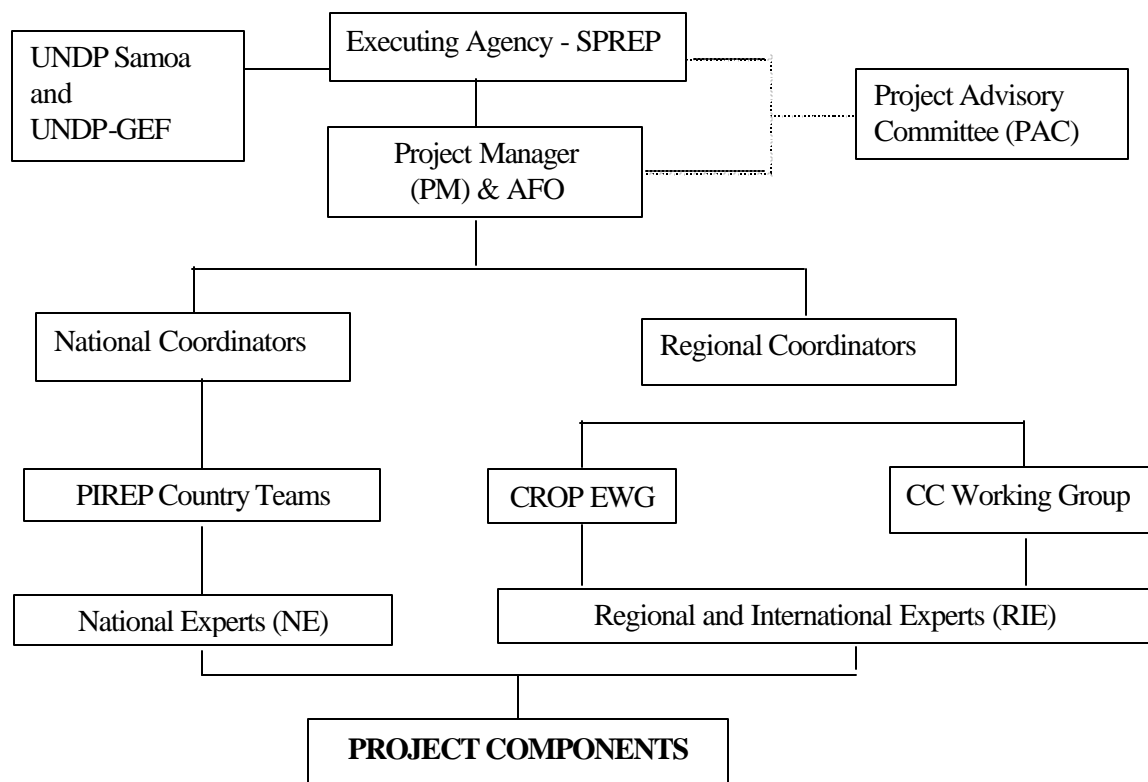
91. SPREP will maintain the same project management office (PMO) established in PIREP and this PMO will be responsible for the overall project operation and financial management and reporting in accordance with the rules and regulations for NEX projects. It will be composed of the CTA/Project Manager (PM), an Administrative and Finance Officer (AFO) and task specialists to implement the 6 components of the PIGGAREP, and will be under the supervision of SPREP. Samoa-based, regional or international experts will support the PMO as and when needed to undertake the project activities. The PMO will coordinate with all the project partners, particularly those implementing parallel projects whose results feed in, or are integral parts, of the PIGGAREP. The PM will primarily be responsible for coordinating, providing technical advice and ensuring that project activities at the national and regional levels are efficiently and cost effectively carried out. He/she will continuously liaise with the Forum-established Ad-hoc Working Group on Climate Change, the CROP EWG, the National Coordinators, the Environment and Energy Sector stakeholders, the civil society and the co-financing partners. He/she will also be responsible to UNDP for the achievement of project development objectives and for all reporting, including the submission of work plans and financial reports. The project will be executed fully in line with UNDP national execution procedures, as detailed in the NEX Manual. The AFO will be responsible to the PM and will primarily deal with the secretarial and financial matters of the project.

92. As the PIGGAREP executing agency, SPREP will be the sole agent responsible for overall planning, management, coordination and administration of PIGGAREP. PIGGAREP will be part of SPREP's Climate Change Programme. SPREP will provide administrative, logistical and technical support for the PM and AFO. SPREP, as part of its in-kind contribution to PIGGAREP will, on a part-time basis, make available various staff with specialised expertise relevant for the project such as in the areas of climate change, capacity building (including training, etc), data base development, sustainable development, environmental impact assessment, etc. Additional actual costs related to project support and implementation will be charged to the project and monitored closely to ensure they are within agreed budgetary limits.

93. SPREP will be accountable to UNDP Samoa for the achievement of the project development objectives and for all reporting, including the submission of work plans and financial reports. SPREP will be responsible for financial control of the GEF project implementation using the National Execution (NEX) modality of UNDP. SPREP will make arrangements to enable, to the extent practicable, the decentralized management of the project. SPREP, working with the PM,

will assume responsibility for entering into the necessary work arrangements with other regional organizations to maximize efficient and effective project implementation. SPREP will also provide the PM with full authority to engage services consistent with delegations provided by the Director under SPREP’s Financial Regulations. SPREP will provide the PM with full support in order to maintain a close record of all expenditures planned or made under the project in full accordance with UNDP’s NEX procedures, as detailed in the NEX Manual. In addition to SPREP and UNDP, the PM will also report to the PAC on the disbursement of funds under this project in order to ensure full transparency of action.

PIGGAREP ORGANIZATIONAL CHART



INCREMENTAL COST, PROJECT FINANCING AND SCHEDULE

94. The total estimated project cost (excluding the MSP preparatory phase exercise, which cost US\$ 781,000 to carry out) is US\$ 26.025 million. In addition to the US\$ 5.225 million requested from GEF, the PIC Governments, donors and co-financing partners, will contribute a baseline cost of US\$ 20.80 million. These contributions were discussed during the preparatory phase and have been confirmed in the attached letters of expression of interests.
95. The cost for all of incremental activities that will be carried out in the project components amounts to US\$ 5.225 million. This is the amount to be granted by the GEF. The Table below summarizes the project cost details. The incremental cost analysis is presented in Annex A.

Estimated Project Budget ((US\$))

Project Component		Baseline	Incremental	Total Cost	%
No	Name				
1	Technical Capacity Building and Technical Support	13,700,000	1,650,000	15,350,000	59
2	Market Development	500,000	400,000	900,000	3
3	Institutional Strengthening	4,800,000	1,675,000	6,475,000	25
4	Financial Support	400,000	400,000	800,000	3
5	Policy and Regulatory Support	500,000	250,000	750,000	3
6	Information and Awareness Enhancement	900,000	850,000	1,750,000	7
Total		20,800,000	5,225,000	26,025,000	100

96. The project budget will be distributed as follows: US\$ 15.35 million would be utilized for Technical Capacity Building and Technical Support, US\$ 0.90 million for Market Development, US\$ 6.475 million for Institutional Strengthening, US\$ 0.80 million for Financial Support, US\$ 0.75 million for Policy and Regulatory Support, and US\$ 1.75 million for Information and Awareness Enhancement.
97. The funds requested from GEF will be utilized to support all incremental activities, and to supplement some of the baseline activities, which would require additional funds to enable and ensure effective implementation that would facilitate the realization of expected domestic and global environmental benefits. Of the GEF funds requested, US\$ 1.65 million would be utilized for Technical Capacity Building and Technical Support, US\$ 0.40 million for Market Development, US\$ 1.675 million for Institutional Strengthening, US\$ 0.40 million for Financial Support, US\$ 0.25 million for Policy and Regulatory Support and US\$ 0.85 million for Information and Awareness Enhancement.
98. The baseline contribution from UNDP (estimated at US\$ 0.5 million) will be that portion of its budgetary allocation in PIEPSAP for the component of Policy and Regulatory Support plus allocation from the Asia-Pacific Regional Energy Programme for Poverty Reduction Project (REP-PoR) and other bi-lateral projects.

Project Co-financing Sources

Co-financier	Classification	Type	Amount US\$	Status
UNDP-Samoa	Donor Agency	Cash	500,000	Expression of Interest
SPREP	Regional Organisation	In-kind	250,000	Expression of Interest
SPREP	Regional Organisation	Cash	250,000	Expression of Interest
PIC Governments	Government	In-Kind	2,300,000	Expression of Interest
PIC Governments	Government	Cash	16,500,000	Expression of Interest
Others	Private Sector & Regional Organizations	Cash	1,000,000	Expression of Interest
Total Co-financing			20,800,000	

99. The project will be carried out over a period of 5 years. Annex D shows the proposed schedule of activities.

MONITORING AND EVALUATION

100. The project will be monitored and evaluated periodically in line with the UNDP and UNDP/GEF rules and procedures. The framework for overall monitoring, reporting and evaluation are mentioned below.
101. The project will be subject to a Multipartite Review (joint review by representatives of participating governments, the Executing Agency, CROP members, and the UNDP) organized by UNDP Samoa. The project will also be subject to an annual GEF Project Implementation Review (PIR). The Executing Agency will prepare and submit to UNDP Samoa an Annual Project Report (APR) two months prior to the Multipartite review meeting. UNDP-Samoa may request, as necessary, additional monitoring activities during project implementation. UNDP will also undertake annual monitoring and evaluation (M&E) visits to project sites, as it deems necessary to view project developments in accordance with UNDP procedures for M&E.
102. Project monitoring will be provided in accordance with UNDP established procedures and will be provided by the UNDP Samoa with support from UNDP-GEF.
103. The main coordinating organisations/mechanisms, SPREP, the PAC, and the PIREP Country Teams will undertake continuous, self-monitoring using the Target Outputs (success indicators) specified in the Results Framework to be outlined in the UNDP Project Document. These performance indicators will be assessed continuously by the PM. The PAC and the PIGGAREP Country Teams will assess the performance every time they meet or when needed.
104. *Reporting and Dissemination* - The PM will prepare and submit through SPREP Management quarterly progress reports to UNDP Samoa. The Country Team Coordinators, in cooperation with the Country Teams, will prepare and submit quarterly accomplishment reports to the PM/SPREP. The PM will prepare and submit through SPREP Management to the UNDP Samoa and UNDP-GEF for examination one month before each 12-month project period, an Annual Project Report (APR) as well as other reports requested by UNDP and GEF. The progress reports shall be concise describing activities undertaken, issues confronting the project and the progress of work with respect to work accomplished and budgets expended.
105. *Financial Monitoring* - Financial Reports will be prepared by PM/SPREP and submitted to UNDP Samoa on a quarterly basis in accordance with the *Guidelines for National Execution*.
106. *Multipartite Reviews* - The project will be subject to reviews by representatives of the executing agency (SPREP), UNDP Samoa and the participating countries. During review meetings, the project performance will be measured against established work plans, expenditures will be reviewed and the overall technical performance will be discussed.
107. *Final Evaluation* - The project is subject to two in-depth independent reviews. One will be conducted in the mid-term (first quarter of the third year) and the other will be scheduled upon project termination. A terminal report would be completed prior to the completion of the project and would detail project achievements and lessons learned. Additional independent evaluation may be conducted if UNDP and the GEF deem it necessary.

ANNEX A INCREMENTAL COST ANALYSIS

A1. Broad Development Goals

At their special Retreat in Auckland on 6 April 2004, Pacific Islands Leaders issued a Declaration adopting the following Vision:

Leaders believe the Pacific region can, should and will be a region of peace, harmony, security and economic prosperity, so that all of its people can lead free and worthwhile lives. We treasure the diversity of the Pacific and seek a future in which its cultures, traditions and religious beliefs are valued, honoured and developed. We seek a Pacific region that is respected for the quality of its governance, the sustainable management of its resources, the full observance of democratic values, and for its defence and promotion of human rights. We seek partnerships with our neighbours and beyond to develop our knowledge, to improve our communications and to ensure a sustainable economic existence for all.

In this declaration, Leaders highlighted the importance of sustainable development, governance and security as priorities for the PICs. The PICs have ratified multinational environmental agreements (MEAs) like the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD), The United Nations Convention to Combat Desertification (CCD) and the Stockholm Convention on Persistent Organic Pollutants (SC POPs) based on the priority that they place on environmental sustainability and appreciating that the PICs is one of the most environmentally vulnerable regions of the world.

A2. Baseline Activities

The PICs Leaders have continuously called for concrete efforts to reduce the emissions of GHG. To put this into practice, the widespread use of feasible RE technologies has been highlighted as a priority activity in the PICs' Initial National Communications, National Sustainable Development Strategies and National Economic Plans and in their submissions to the WSSD and the BPoA +10. However, the experiences on the ground have not been very encouraging and the progress has generally been very slow. Without the PIGGAREP, the reduction of the long-term growth of GHG emissions in the PICs will remain to be business-as-usual (BAU).

Under this business-as-usual (BAU) scenario, the following are anticipated: (a) GHG emissions from the use of fossil fuels will continue to grow rapidly and mostly unabated; (b) Increasing dependence on imported energy will continue to contribute to significant current account deficits and to a high vulnerability of PICs with respect to price shocks in the world energy markets; (c) Local air pollution due to combustion of fossil fuels will increase; (d) Fragile coastal ecosystems will remain endangered by hazards related to transport and use of fossil fuels; (e) Greenhouse gas mitigation activities and RE developments will be carried out without clear sense of direction and guidance; (f) Rural electrification efforts will be restricted to mostly grid extensions, remote and rural areas will remain without convenient and efficient modern forms of energy, and reliable electricity supply; (g) Productive uses of RE, which could improve livelihoods and promote income generation in rural areas are not taken advantage of; (h) No development of local industries with adequate capacities to manufacture RE system products and components and to supply RE related services; (i) Private sector will continue to play a marginal role as investors and providers of RE based energy services;

(j) Funding of RE initiatives – if they take place – will be outside the established local financial systems and channelled through donor organizations without giving local financial institutions a chance to acquire lending/financing capacity for RE; (k) Urgently needed legislation and policy reform processes to adequately support sustainable development principles will not be initiated; (l) Insufficient scarce public resources will be allocated to support the rural poor and reduce the electricity access gap between urban and rural areas; (m) Experiences in the region will not be effectively shared and scale economies in project preparation (procurement of specialized services) and capacity building (training workshops etc) will not accrue; and, (n) Coordination between ongoing and planned activities on RE will be inefficient, or none. Furthermore, if the present situation in the area of RE development and utilization in the PICs is not addressed the region will fall further behind dynamic global RE developments that have already started in other parts of the world; progress towards achieving the Millennium Development Goals (MDGs) in the region will be hampered; and, there will be no additional strong basis for PICs negotiating on positions at the Conference of the Parties to the UNFCCC.

The implication of the above scenario is a continued reliance of the PICs on petroleum fuels to meet energy needs with a strong likelihood of unsustainable energy sector development. The successful implementation of the PIGGAREP is estimated to reduce CO₂ emissions by at least 30% by 2015 as compared to that in the BAU scenario.

A3. Global Environmental Objective

The global environment and development objective of the project is the reduction of the growth rate of GHG emissions from fossil fuel use in the PICs through the removal of the barriers to the widespread and cost effective use of feasible RETs both for energy and non-energy (i.e., productive uses) purposes. The project purpose is the removal of barriers to the widespread utilization of RETs in the PICs through their application for productive uses. To achieve the project purpose, PIGGAREP will comprise of 6 major components, each of which is a specific program consisting of specific activities designed to address the barriers to the widespread adoption of RETs in the PICs and to support their sustainable development effort.

A4. GEF Alternative

The proposed project is the Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP).

The proposed project is made up of six (6) components that will address in an integrated fashion the barriers to the widespread development and utilization of RE resources in the PICs. Each component of the project will consist of a number of specific activities designed to address these barriers. These activities will address the shortfall of the past and current efforts by the PIC governments and the private sector in the PICs achieving widespread adoption of feasible RE technologies, management practices, maintenance and operational practices. The six GEF funded alternative components are as follows:

Component 1: Technical Capacity Development and Technical Support - This component will deal with the lack of successful commercial installations on the ground, the lack of awareness as to the RE resources potentials in the PICs and the absence of technical standards as a guide for RE equipments and their installations. It will consist of three sub-components: (1) RE Resources Assessments; (2) Technical Support; and, (3) RE Demonstration Schemes, that would help bring about increased

number of successful commercial RE applications in the PICs. These additional capacity building and support activities will cost US\$ 1.65 million to implement. The total cost of the baseline activities is US\$ 13.70 million and would involve mostly hardware installations. This component will cost a total amount of US\$ 15.35 million to implement. This reflects not only the scientific and expensive nature of the resources assessment, but also the importance of knowing whether the RE resources potentials are existent before any other effort to facilitate and confirm their techno-economic feasibilities for harnessing.

Component 2: Market Development Support - This major component of the project will address the barriers to the development of a market for RE products and services, both nationally and regionally. These additional capacity building and support activities will cost US\$ 0.4 million to implement. The total cost of the baseline activities is US\$ 0.5 million and would involve preliminary feasibility studies in the PICs. This component will cost a total amount of US\$ 0.9 million to implement.

Component 3: RE Institutional Strengthening - This component of the project will address the institutional issues regarding the development and implementation of RE initiatives in the PICs that have persisted for at least the past 3 decades. These additional capacity building, establishment and support activities will cost US\$ 1.675 million to implement. The total cost of the baseline activities is US\$ 4.8 million and would involve parallel institutional strengthening activities. This component will cost a total amount of US\$ 6.475 million to implement and reflects the importance of removing the institutional barriers to the widespread use and commercialisation of RETs in the PICs.

Component 4: RE Financing Support - This component of the project will address the financial barriers to the widespread application of RETs in the PICs, and will also involve activities that are aimed at increasing the access to financing for RE projects and community-based projects that are supported by RE. These additional capacity building, establishment and support activities will cost US\$ 0.4 million to implement. The total cost of the baseline activities is US\$ 0.4 million. This component will cost a total amount of US\$ 0.8 million to implement.

Component 5: RE Policy and Regulatory Support – This project component will build on whatever existing legislations and policies of the PIC governments regarding RE development and utilization have at the moment. It aims to remove the policy and regulatory barriers that have persisted since the 70s despite abundant experience and lessons learned from previous projects. This component is also to bring about strengthened legal and regulatory structures in the energy and environmental sectors of the PICs. These additional capacity building, establishment and support activities will cost US\$ 0.25 million to implement. The total cost of the baseline activities is US\$ 0.5 million. This component will cost a total amount of US\$ 0.75 million to implement.

Component 6: RE Information and Awareness Enhancement - This project component will address the information barriers that hinder the widespread development and implementation of RE system (electricity and non-electricity) projects in the PICs. These will include technical information that are required in the conceptualisation/design of potential RE projects, and market information that are necessary in evaluating the economic/financial viability of RE projects (e.g., electricity prices, fuel prices, electricity demand). These additional capacity building, establishment and support activities will cost US\$ 0.85 million to implement. The total cost of the baseline activities is US\$ 0.9 million and would involve current information and awareness activities that the project will link with. This component will cost a total amount of US\$ 1.75 million to implement and reflects the key role of information and awareness enhancement in the development and sustainable utilization of RE in the PICs.

A.5. Incremental Cost Matrix and Project Indicative Budget

Table A-1 shows the incremental cost matrix. The baseline and alternative courses are presented together with the costs of achieving them. The indicative budget (in US\$) for each project component is as follows:

Project Component		Baseline	Incremental	Total Cost	%
No	Name				
1	Technical Capacity Building and Technical Support	13,700,000	1,650,000	15,350,000	59.0
2	Market Development	500,000	400,000	900,000	3.4
3	Institutional Strengthening	4,800,000	1,675,000	6,475,000	24.9
4	Financial Support	400,000	400,000	800,000	3.1
5	Policy and Regulatory Support	500,000	250,000	750,000	2.9
6	Information and Awareness Enhancement	900,000	850,000	1,750,000	6.7
Total		20,800,000	5,225,000	26,025,000	100

Considering the expected 2 million tons CO₂ emissions that will be reduced as an effect (direct and indirect) of the PIGGAREP interventions, and the US\$ 5.225 million GEF assistance, the estimated unit abatement cost of the project is about US\$ 2.5/ton CO₂.

The following table shows the breakdown of the co-financing for the project:

Name of Co-Financier (Source)	Amount, US\$		Total
	Cash	In-Kind	
PIC Governments			
1. Cook Is	1,550,000	150,000	1,700,000
2. Fiji	1,550,000	150,000	1,700,000
3. Kiribati	1,550,000	150,000	1,700,000
4. Nauru	1,550,000	150,000	1,700,000
5. Niue	1,550,000	150,000	1,700,000
6 PNG	1,550,000	150,000	1,700,000
7. Samoa	1,550,000	150,000	1,700,000
8. Solomon Is	1,550,000	150,000	1,700,000
9. Tonga	1,550,000	150,000	1,700,000
10 Tuvalu	1,550,000	150,000	1,700,000
11. Vanuatu	1,550,000	150,000	1,700,000
Regional as a Group	17,050,000	1,650,000	18,700,000
Regional Organizations			
SPREP	500,000		500,000
UNDP	500,000		500,000
Others			
Private Sector			
Investors	1,100,000		1,100,000

Name of Co-Financier (Source)	Amount, US\$		Total
	Cash	In-Kind	
Others			
Donors			
TOTAL			20,800,000

The following shows the distribution of the baseline costs for the full-scale project (US\$).

Contributor	Type	Components					
		1	2	3	4	5	6
PIC Governments							
Cook Is	Cash	1,040,000	30,000	400,000	35,000	20,000	25,000
	In-kind	85,000	20,000	25,000	5,000	5,000	10,000
Fiji	Cash	1,040,000	30,000	400,000	35,000	20,000	25,000
	In-Kind	85,000	20,000	25,000	5,000	5,000	10,000
Kiribati	Cash	1,040,000	30,000	400,000	35,000	20,000	25,000
	In-Kind	85,000	20,000	25,000	5,000	5,000	10,000
Nauru	Cash	1,040,000	0	40,000	0	20,000	90,000
	In-Kind	85,000	0	25,000	0	5,000	35,000
Niue	Cash	1,040,000	30,000	400,000	35,000	20,000	25,000
	In-Kind	85,000	20,000	25,000	5,000	5,000	10,000
PNG	Cash	1,040,000	30,000	400,000	35,000	20,000	25,000
	In-Kind	85,000	20,000	25,000	5,000	5,000	10,000
Samoa	Cash	1,040,000	30,000	400,000	35,000	20,000	25,000
	In-Kind	85,000	20,000	25,000	5,000	5,000	10,000
Solomon Is	Cash	1,040,000	30,000	400,000	35,000	20,000	25,000
	In-Kind	85,000	20,000	25,000	5,000	5,000	10,000
Tonga	Cash	1,040,000	30,000	400,000	35,000	20,000	25,000
	In-Kind	85,000	20,000	25,000	5,000	5,000	10,000
Tuvalu	Cash	1,040,000	30,000	400,000	35,000	20,000	25,000
	In-Kind	85,000	20,000	25,000	5,000	5,000	10,000
Vanuatu	Cash	1,040,000	30,000	400,000	35,000	20,000	25,000
	In-Kind	85,000	20,000	25,000	5,000	5,000	10,000
Regional	Cash	11,440,000	300,000	4,400,000	350,000	220,000	340,000
	In-kind	935,000	200,000	275,000	50,000	55,000	135,000
Regional Organizations							
SPREP	Cash					225,000	275,000
	In-Kind						
Private Sector							
	Cash	1,100,000					
	In-Kind						
Others							
UNDP	Cash	225,000		125,000			150,000
	In-Kind						
TOTAL		13,700,000	500,000	4,800,000	400,000	500,000	900,000

The following table shows the budget cost sharing between GEF and the co-financiers of the full-scale project by components/activities:

No	COMPONENTS/ACTIVITIES	GEF	Nat'l Gov't	Reg'l Orgs	Private Sector	Others	Total
A	TECHNICAL CAPACITY DEVELOPMENT AND TECHNICAL SUPPORT						
A1	RE Resources Assessment						
A1.1	Development of a RE Resource Assessment Methodology	40,000					40,000
A1.2	Conduct of RE resources survey:						
A1.2a	Production of a Pacific Wind and Solar Maps / Atlas	170,000	150,000				320,000
A1.2b	Biomass resource assessment	140,000				125,000	265,000
A1.2c	Geothermal resource assessment	20,000	2,000,000				2,020,000
A1.2d	Hydro resource assessment	150,000	500,000				650,000
A1.3	Design and development of a Regional RE Resource Database	33,000					33,000
A1.4	Development of a RE Resource Monitoring and Simulation Methodology	33,000					33,000
A1.5	Conduct of capacity building program on RE resources assessment	66,000					66,000
A2	Technical Support						
A2.1	Evaluation of the viability and requirements for the development of local RE service industry	55,000					55,000
A2.2	Conduct of training course on the design, feasibility evaluation, operation and maintenance of RE systems (electricity and non-electricity)	90,000					90,000
A2.3	Assessment of other value-added applications of RE resources	50,000					50,000
A2.4	Evaluation of RE system utilisation best practices (electricity and non-electricity)	40,000					40,000
A2.5	Design and Initiation of a sustainable RE system R & D program	75,000					75,000
1.2.5	RE system equipment standards setting	77,000					77,000
A.3	RE demonstration projects						
A3.1	Techno-economic feasibility analyses of potential RE-based energy systems project	84,000					84,000
A3.2	Identification and evaluation of RET application demonstration requirements	66,000					66,000
A3.3	Courses on Actions for the removal of barriers to the successful implementation of RE demo projects	88,000				30,000	118,000
A3.4	Establishment of baseline data for the RE demonstration sites	66,000					66,000
A4.1	Design of RE demonstration projects	90,000					90,000
A4.2	Implementation of RE demonstration projects	25,000	9,725,000		1,100,000		10,850,000
A4.3	Monitoring and evaluation of RE demonstration projects	52,000				40,000	92,000
A4.4	Evaluation and dissemination of the results of the demonstration program	80,000				30,000	110,000
A4.5	Design of sustainable follow-up program	60,000					60,000

No	COMPONENTS/ACTIVITIES	GEF	Nat'l Gov't	Reg'l Orgs	Private Sector	Others	Total
	for RE development						
Sub-total		1,650,000	12,375,000	0	1,100,000	225,000	15,350,000
B	MARKET DEVELOPMENT						
B1.1	Supporting of investment project development.	60,000					60,000
B1.2	Promotion of bulk RE system equipment /component purchasing	20,000	50,000				70000
B1.3	Technical assistance on livelihood support	30,000	20,000				50000
B2.1	Assessment of local capabilities for RE services	30,000	20,000				50000
B2.2	Assessment of the viability of local manufacturing of RE system equipment and/or components	30,000	20,000				50000
B2.3	Introduction of a "One-Stop-Shop" service for RE market services	30,000	20,000				50000
B3.1	Development and promotion of ESCO-led RE system projects	35,000	150,000				185000
B3.2	Design and adoption of model fiscal incentives for RE investments	70,000	50,000				120000
B4.1	Training course on RE projects and RE-based livelihood / productivity projects financing	60,000	20,000				80000
B4.2	Establishment of Market for RESCO Services	35,000	150,000				185000
Sub-total		400,000	500,000	0	0	0	900,000
C	INSTITUTIONAL STRENGTHENING						
C1.1	Conduct of training in Integrated Energy Planning	100,000	150,000				250,000
C2.1	Establishment of RE Policy Committees	30,000	150,000				180,000
C3.1	Strengthening of Energy Offices in PICs	1,000,000	4,050,000			50,000	5,100,000
C3.2	Conduct of a detailed study of Energy Supply and Consumption in the PICs	475,000	150,000			125,000	750,000
C3.3	Development of a RE planning model	70,000	125,000				195,000
Sub-total		1,675,000	4,625,000	0	0	175,000	6,475,000
D	FINANCING SUPPORT						
D1.1	RE business financing capacity building	50,000	50,000				100,000
D1.2	Assistance for accessing local financing	50,000	50,000				100,000
D1.3	Establishment of RE financing facility in PICs	50,000	50,000				100,000
D1.4	Design and implementation of smart RE financing schemes	50,000	50,000				100,000
D2.1	Service provision to RE financing applicants	50,000	50,000				100,000
D2.2	Evaluation of the RE financing assistance programme	50,000	50,000				100,000
D2.3	Financing Schemes review	50,000	50,000				100,000
D2.4	Sustainable follow up program design	50,000	50,000				100,000
Sub-total		400,000	400,000	0	0	0	800,000
E	POLICY AND REGULATORY SUPPORT						
E1.1	Formulation and implementation of national energy policy	30,000	30,000			30,000	90,000

No	COMPONENTS/ACTIVITIES	GEF	Nat'l Gov't	Reg'l Orgs	Private Sector	Others	Total
E1.2	Conduct of RE Policy Review	10,000	10,000			10,000	30,000
E1.3	RE policy analyses	35,000	35,000			35,000	105,000
E2.1	Study on RE-based livelihood and productivity projects support policy	10,000	35,000			30,000	75,000
E2.2	Evaluation of the national energy policy implementation	40,000	40,000			20,000	100,000
E3.1	RE electricity policy study	25,000	25,000			50,000	100,000
E3.2	RE electricity pricing study	25,000	25,000			50,000	100,000
E4.1	Legislation on RE system Equipment / Components Standards	25,000	25,000				50,000
E5.1	Conduct of RE promotion workshops	50,000	50,000				100,000
Sub-total		250,000	275,000	0	0	225,000	750,000
F	INFORMATION AND AWARENESS ENHANCEMENT						
F1.1	Establishment of a RE information centre	60,000	60,000	40,000		150,000	310,000
F1.2	Establishment and Implementation of an integrated RE information exchange service	50,000	50,000	40,000			140,000
F1.3	RE advocacy and Promotion	200,000	100,000	30,000			330,000
F1.4	Information campaigns on RE technology applications	250,000	40,000	40,000			330,000
F1.5	RE Website development	20,000	40,000	40,000			100,000
F2.1	Regional RE awards program	50,000	45,000	10,000			105,000
F3.1	Design and conduct of a RE technology education program	60,000	70,000	20,000			150,000
F3.2	Design and implementation of RE training program	160,000	70,000	55,000			285,000
Sub-total		850,000	475,000	275,000	0	150,000	1,750,000
TOTAL		5,225,000	18,650,000	275,000	1,100,000	775,000	26,025,000

Annex A-1: Incremental Cost Matrix

Component	Baseline	Alternative	Increment
Component 1: Technical Capacity Development and Technical Support	<p>Business as Usual PICs will continue to do RE resources assessment on an ad-hoc basis utilising methodologies that are not tailored for PICs. RE hardware installations are made without full consideration of the need for RE market expansion, competitiveness against fossil fuel, raising the productivity from RE utilisation, replication, sustainability, GHG emissions, etc.</p>	<p>Proposed Situation RE resources potentials at feasible projects sites and GHG emission level are accurately identified. New and rehabilitated installations of RE-based energy projects for power and productive uses on the ground.</p>	<p>Additional Features More understanding of the RE resources potentials and GHG emission level in PICs. Additional number of RE-based energy system installations (for power and productive use) on the ground.</p>
	<p>Domestic Benefits No solid foundation from which feasibility and investment studies can be based upon. No real reduction in GHG emissions.</p>	<p>Domestic Benefits More interests to further explore economic and technical feasibility of identified RE project sites (power and productive uses). Reduction in GHG emissions.</p>	<p>Domestic Benefits Additional understanding and interests to further explore economic and technical feasibility of identified sites. Additional reduction in GHG emissions and provision of cost-effective and sustainable sources of electricity.</p>
	<p>Global Benefits Lack of interests and investments on RE projects.</p>	<p>Global Benefits Cohesive and coordinated national and regional effort in reduction of the long-term growth in GHG emissions resulting from the combustion of fossil fuels.</p>	<p>Global Benefits Net increase in reduction of GHG emissions</p>
Cost (US\$)	13,700,000	15,350,000	1,650,000
Component 2: RE Market Development	<p>Business as Usual Development of RE continues to be driven by donor-funded programmes. Competitiveness of RETs against fossil fuel (or vice versa) continues to be based on guesses. Only a few private sector investors are involved in RE.</p>	<p>Proposed Situation A pipeline of ‘bankable’ projects addressing the business and sustainable angles of RE service delivery are readily available for financiers, donors and investors.</p>	<p>Additional Features Number of additional ‘bankable’ projects.</p>

Component	Baseline	Alternative	Increment
	<p>Domestic Benefits None.</p>	<p>Domestic Benefits Negotiations and financial and investment deals are struck for the financing of GHG reduction / RE projects.</p>	<p>Domestic Benefits New investment and financing agreements for new GHG reduction / RE projects.</p>
	<p>Global Benefits None.</p>	<p>Global Benefits A strong regional profile on RE-based power generation & productive uses of RE.</p>	<p>Global Benefits Reduced GHG emissions.</p>
Cost (US\$)	500,000	900,000	400,000
Component 3: Institutional Strengthening	<p>Business as Usual The promotion of RE continues but this is largely carried out on an ad-hoc basis based on ineffective plans and policies, outdated mandates and with unqualified and inexperienced staff.</p>	<p>Proposed Situation Improved local capacity, expertise and experiences in the PICs to (i) monitor, analyse and interpret their RE potentials; (ii) to plan, coordinate, manage, maintain and monitor RE projects; (iii) to carry out public awareness campaigns and (iv) to disseminate best practices. There will be more financially sustainable RE-based energy projects on the ground.</p>	<p>Additional Features New RE-based energy projects (power and productive uses) are designed, implemented and maintained by local experts. There is one additional local graduate from each PIC on GHG mitigation / RE studies.</p>
	<p>Domestic Benefits Limited in-country training opportunities, which are geared towards country-specific needs. RE projects suffer from the absence of legal, institutional, economic and financial advice.</p>	<p>Domestic Benefits Sufficient numbers of local training opportunities are delivered based on local needs and available target audiences. More advice given to projects on the ground.</p>	<p>Domestic Benefits More civil servants, private sector and rural communities people are given hands-on training based on local circumstances, language and projects. Additional advice given to projects on the ground.</p>
	<p>Global Benefits Benefits from further assistance to reduce GHG emissions are not sustainable. Early failures of RE projects.</p>	<p>Global Benefits Benefits from further assistance to reduce GHG emissions are sustainable. More successful RE-based energy (power and productive uses) projects on the ground.</p>	<p>Global Benefits GHG emissions reduction. Additional commercially viable RE-based energy projects (power and productive uses) on the ground.</p>
Cost (US\$)	4,800,000	6,475,000	1,675,000

Component	Baseline	Alternative	Increment
Component 4: Financing Support	Business as Usual The financing institutions will continue not to give innovative financing schemes to RE due to their lack of understanding of REs. Financing of RE projects will continue to be from 'general funds' rather than a special fund for RE development only.	Proposed Situation A source of capital for financing RE-based energy system (power and productive uses) projects.	Additional Features An operational regional sustainable capital fund for financing RE-based energy system (power and productive uses) projects.
	Domestic Benefits GHG mitigation projects are not considered as priority RE projects for financing.	Domestic Benefits Feasible RE-based energy projects are financed. Savings in imported fossil fuels	Domestic Benefits New RE-based energy system projects are financed. Savings in imported fossil fuels
	Global Benefits No additional RE-based energy projects on the ground, hence, no GHG emissions reduction.	Global Benefits A strong regional profile on RE-based power generation & productive uses of RE. Reduction in GHG emissions	Global Benefits Reduced GHG emissions
Cost (US\$)	400,000	800,000	400,000
Component 5: Policy and Regulatory Support	Business as Usual Absence of the necessary legislative tools, policies, and RE development and GHG mitigation targets in some PICs. The policies, which have been adopted in some PICs, will continue to be ineffective.	Proposed Situation Legislative tools, policies, RE development and GHG mitigation targets are in place	Additional Features New legislations, policies and targets on RE development & utilization are adopted.
	Domestic Benefits RE development and application efforts continue with no sense of direction.	Domestic Benefits RE effort are carried out based on clear legislative and adopted policy directions and targets.	Domestic Benefits Additional cohesiveness of local effort to have successful GHG reduction from RE projects.
	Global Benefits No GHG emissions reduction.	Global Benefits Increased opportunities for private sector investments on RE-based energy systems (power and productive uses)	Global Benefits GHG Emissions reduction. International RE business opportunities
Cost (US\$)	500,000	750,000	250,000

Component	Baseline	Alternative	Increment
Component 6: Information and Awareness Enhancement	Business as Usual PIC s will continue to be unaware of best practices and success stories thus making it extremely difficult to raise the profile, the confidence and the approval rating of RE in the political spheres, in the donors and investors communities and to the public at large.	Proposed Situation PIC s are aware of best practices and success stories thus raising the profile, the confidence and the approval rating of RE in the political spheres, in the donors and investors communities and to the public at large.	Additional Features Additional awareness, confidence and approval rating of RE.
	Domestic Benefits Best practices and success stories are either ignored or ineffectively covered.	Domestic Benefits Effective coverage and dissemination of best practices and success stories	Domestic Benefits Enhanced information dissemination and understanding
	Global Benefits Confidence and approval rating of RE-based energy system projects remain low. No GHG emissions reduction.	Global Benefits Accelerated increase in reduction of GHG emissions; Improved local and regional competency on RET applications.	Global Benefits Net increase in GHG emissions reduction
Cost (US\$)	900,000	1,750,000	850,000
TOTAL COST (US\$)	20,800,000	26,025,000	5,225,000

ANNEX B: Project Planning Matrix

The project planning matrix (PPM) presented below was developed during the MSP Results Workshop held in Apia, Samoa on 5-9 July 2004. It reflects a consensus achieved among representatives from the 15 countries that have participated in the PIREP of the expected activities and outcomes/outputs of the planned comprehensive regional RE project, which is the PIGGAREP.

Strategy	Objectively Verifiable Indicators (OVI)	Means of Verification (MoV)	Critical Assumptions and Risks
I. DEVELOPMENT OBJECTIVE/GOAL			
Reduction of the growth rate of GHG emissions from fossil fuel use in the PICs through the widespread and cost effective use of RE resources and application of feasible RE technologies	GHG emissions in PICs reduced by at least 2 million tons by 2015. The potentials of available and feasible RE resources in the PICs are assessed, developed and used effectively for both electricity and non-electricity applications	Monitoring and evaluation report on avoided GHG emissions with respect to baseline Project follow-up report, statistical reports and official publications	Support from the PIC Governments throughout project life Political stability in the region Effective and efficient country teams and the backstopping support and cooperation of regional and international experts.
II. IMMEDIATE OBJECTIVES/OUTCOMES			
A. Improved knowledge about RE resources potential and increase the number of successful commercial RE applications on the ground	A1. At least 10 resource monitoring studies completed at 10 sites by 2010 A2. At least 10 RE projects commercially sustainable in 10 PICs by 2010	A1. Resources monitoring reports A2. Monitoring & Evaluation based on data from the project sites	Support from the projects sites, the landowners and the meteorology offices
B. Expansion of the market for RET applications	B1. At least one RET company in each PIC by 2010 B2. At least 100 MW of additional RE installed in PICs by 2015	B1. Registry of companies, files from responsible ministry B2. Power Utilities statistics	Feasible RE-based energy projects will be identified. Productive use projects are identified and are commercially viable.
C. Enhancement of institutional capacity to design and implement RE	C1. At least one RE project designed and implemented by local experts in each PIC by 2010 C2. At least ten energy offices have established national energy coordination committees, have clear mandates, strategies and action plans	C1. Annual Reports of the Energy Offices	Energy gets a higher profile in the PIC governments
D. Improvement of the availability of funding for existing and new RE projects	D1. At least US\$100 million of new investments in RE by 2015	D1. Bank records, project files at responsible ministry or agency national surveys	Successful projects on the ground are convincing to banks, investors and the private sector
E. Strengthened legal and regulatory structures in the	E1. All PICs have a relevant Act / provisions (Energy and Environment) in place by 2010 that	E1. Government gazettes E2. Legal records and parliamentary	PICs governments are supportive of the new Act to promote RE

Strategy	Objectively Verifiable Indicators (OVI)	Means of Verification (MoV)	Critical Assumptions and Risks
energy and environmental sectors	supports RE development and utilization and the formulations of RE regulations and policies	records	
F. Increased awareness and knowledge about RE among key stakeholders	F1. Majority of energy sector professionals, politicians, investors, senior government officials and the general public are aware of the benefits of RE and local success stories by 2010. F2. Technical, economic, social and environmental characteristic of 10 RE projects comprehensively documented and accessible via internet based information system by 2010 F3. At least 75 % approval rating for RE technologies and projects in PICs by 2010	F1. National surveys within project M&E F2. Number of hits recorded at the sites F3. Independent survey in the framework of the project Monitoring & Evaluation	F1. Effective outreach methods are employed. F2. Access to the internet continues to increase in the PICs F3. There are more convincing success stories on the ground
III. OUTPUTS			
A1. Better understanding of RE resources potential A2. Quality of delivery of RE services improved A3. RE projects made more sustainable A4. Design of RE systems improved A5. Socially and environmentally sound application of RET established	A1. At least 10 resource monitoring studies completed at 10 sites by 2010 A2. Collection efficiency (>90%) for each of the identified demonstration project by 2008 A3. At least 8 existing RE projects are assessed and technical assistance provided A4. At least 2 training courses on RE system designs conducted annually A5. Technical standards for RE systems components and their installations are adopted by 8 PICs in 2009.	A1. Resources monitoring reports A2. Monitoring and evaluation reports A3. Assessment reports and project records A4. Reports of the training courses A5. Legal and Parliamentary records	A1. Landowners support A2. Improved service delivery is matched with improved fee payment A3. Technical assistance provided is effective A4. Trained staff are retained A5. Governments are supportive of the standards
B1. Increased demand for RETs stimulated B2. Private sector participation in RET supply and operation mobilized B3. Improved access of RET in rural areas B4. Technical capacity and expertise for O & M made available in rural areas	B1. 20 new 'bankable RE projects' / 100 MW new projects identified and funded by 2015 B2. 5 new manufacturers of RE systems and 3 'one-stop-shops' established in the PICs by 2008. B3. 5 new RESCOs and 5 rural RE suppliers established in the PICs by 2008 B4. 5 new RESCOs established in the PICs by 2008 and at least 300 rural residents receiving basic O & M training	B1. Feasibility study reports B2. Register of Companies and Businesses and the Annual Reports of the energy offices. B3. Register of Companies and Businesses B4. Register of Companies and Businesses and Training Reports	B1. No significant decrease in fossil fuel prices B2. Governments provide incentives for the private sector B3. Governments provide incentives to the private sector B4. Governments provide incentives to the private sector and training is in the local language.
C1. Good governance and better management	C1. All new RE projects are components of an adopted national energy / climate change	C1. Adopted national energy and/or climate change mitigation plans	C1. National energy offices are effective and proactive

Strategy	Objectively Verifiable Indicators (OVI)	Means of Verification (MoV)	Critical Assumptions and Risks
<p>accountability established at national level</p> <p>C2. Private sector involvement facilitated</p> <p>C3. Appropriate staff levels and sufficient resources for effective RE programs established</p>	<p>mitigation plan by 2010</p> <p>C2. National coordinating mechanisms, including the private sector, established in all PICs by 2008</p> <p>C3. All Energy Offices are staffed with at least 3 graduates, have clear mandates, have reliable databases for planning and policy works and have adopted energy plans by 2010.</p>	<p>C2. Minutes of the meeting of the coordination committees.</p> <p>C3. Annual Reports of the Energy Offices.</p>	<p>C2. There are continuous interest by the private sector</p> <p>C3. Government support.</p>
<p>D1. Improved access to financing for small rehabilitation and failing projects</p> <p>D2. Improved access to and availability of financing for new RE projects</p>	<p>D1. At least US\$5 million is invested on rehabilitating existing projects by 2010.</p> <p>D2. Feasibility of a regional/national RE fund is studied and capital fund of US\$10 million is available for new RE projects by 2010</p>	<p>D1. Bank and energy office records</p> <p>D2. Bank and energy office records</p>	<p>D1. Investors have confidence on RE</p> <p>D2. Investors have confidence on RE</p>
<p>E1. National Energy / Climate Change policies and guidelines are assessed, (re)formulated and adopted</p> <p>E2. Appropriate incentives to encourage RE-based livelihood and productivity projects are in place</p> <p>E3. Real economic costs of energy sources, electricity and other forms of energy are known</p> <p>E4. Legislation of RE system equipment/component standards developed and implemented</p> <p>E5. Effective coordination of RE and other national sustainable development effort</p>	<p>E1. At least 8 PICs adopt RE/CC policies and guidelines by 2008</p> <p>E2. Specific policies and incentives for RE-based livelihood and productivity projects are in place in 8 PICs by 2008</p> <p>E3. Outcome of energy pricing studies available to all PICs for planning and policy formulations by 2008</p> <p>E4. Technical standards for RE systems components and their installations are adopted by 8 PICs in 2009</p> <p>E5. RE features prominently in national plans and strategies as well as in submissions to regional and international for a</p>	<p>E1. Cabinet decisions</p> <p>E2. Cabinet decisions</p> <p>E3. Energy Pricing study reports</p> <p>E4. Legal and Parliamentary Records</p> <p>E5. Government plans and reports</p>	<p>E1. Cabinet approves RE/CC policies and guidelines</p> <p>E2. Cabinet approves incentives and policies</p> <p>E3. Cooperation of energy suppliers / service providers</p> <p>E4. Effective consultation between public and private sector agencies</p> <p>E5. Effective local coordination</p>
<p>F1. Awareness of best practices of RE projects created amongst key</p>	<p>F1. Each PIC has a regular RE public awareness program and a RE website, by 2007</p> <p>F2. Each PIC has an annual RE award program</p>	<p>F1. Project monitoring and evaluation reports</p> <p>F2. Energy Office reports</p>	<p>F1. No government restrictions on the free flow of information</p> <p>F2. There is active local</p>

Strategy	Objectively Verifiable Indicators (OVI)	Means of Verification (MoV)	Critical Assumptions and Risks
stakeholders F2. Effective promotion and recognition of innovative and successful RE initiatives F3. RE training programs designed and implemented	operational by 2007 F3. Training programs designed and 2 national training workshops conducted annually in each PICs with a total roll of 2000 trainees by 2010	F3. Training reports	participation by all stakeholders F3. Training contents are practical and easily understood

Annex C: Risk Analysis and Management Matrix

Risk Event	Cause	Impact on			Risk Management Mitigation	Examples
		End Consumer	Intermediary	Government		
Inadequate Technology choice; Immature Non Commercial R&D	Donor driven projects; Lack of information and Understanding; Lack of coherent policy; Poor quality project designs	No tangible benefit; Loss of confidence on RE	Loss of investment; No participation; Loss of confidence on RE	Drain on scarce human capacity; Loss of confidence on RE	Clear priorities set by government; Binding project preparation guidelines	Promotion of wind power in PICs near the Equator
Catastrophic events: Hurricane Tsunami Earthquake	Force majeure; Inadequate design Absence of insurance cover	Loss of investment and supply Reduced quality of life	Loss of investment	Loss of investment	Risk analysis; Adequate design; Early warning; Risk Management procedures	Wind energy New Caledonia (Erica); Ghatere micro hydro scheme (Tsunami); First PV project Apolima, Samoa
O&M Failure Total default Inefficient operation	Lack of structure and capacity; Difficult spare part supply	Supply interruption Increased cost (need for substitution)	Loss of revenue; Loss of business;	Loss of investment	Adequate design; Institutionalise energy services providers	Pohnpei solar photovoltaic projects
Direct Government intervention Implementation through government dept. Government ownership	Lack of market and private sector development policy; Lack of interest from private sector players Non commercial technology	Unsustainable supply Poor quality energy services	No involvement; No business opportunities	Loss of investment; Drain on capacity	Policy towards market driven development; Early involvement of private sector in project development Country team approach with strong private sector / power utility participation	PV Programs in Tonga, Cook Islands
Market Distortions Subsidized energy prices Fiscal discrimination Information deficit	Political considerations; Lack of understanding; Lack of income; Lack of adequate social policy framework	Consumer rent but long term uncertainty;	Lack of business opportunity;	Foregone chance to develop RE; Drain on scarce financial resources	Design subsidies to be temporarily and announce removal Awareness/capacity building for decision makers	
Overestimated RE Potential	Measuring programs faulty or insufficient	Inadequate supply Higher prices/tariffs	Higher production cost	Consumer dissatisfaction	Use of professional expertise in resource	Wind farm Noumea, New

Risk Event	Cause	Impact on			Risk Management Mitigation	Examples
		End Consumer	Intermediary	Government		
Inadequate analysis Long term fluctuations (hydro)	Methodological errors Lack of data		Commercial viability not possible	with government policy Loss of confidence	analysis; longer resources monitoring periods; Management of resources/catchments	Caledonia
Inadequate Feedstock Supply; Seasonal Fluctuations; Market risks	Biomass feedstock supply not adequately planned; Price fluctuations /competitive uses	Interruptions in power supply	Loss of revenue	Increased unemployment	Adequate design; Conservative feedstock analysis	Samoa Forest Products wood fired turbo generator; Coconut production in various PICs
Lack of support from landowners; Unclear ownership; Disagreement over compensation; Open-ended royalty claims	Customary land rights; Inadequate stakeholder consultations; Unreasonable claims	No project/No supply	Waste of project preparation fund; Loss of investment; Loss of revenue	Loss of credibility; Difficulty to attract foreign investment	Stakeholder consultation; Landowner participation in projects; Legally binding agreements; Enforcement of agreements	Lungga small hydropower, Solomon Islands; Malu'u micro hydro Solomon Islands; Monasavu catchments disputes, Fiji
Poor Tariff Collection: PV systems Grid power/hydro schemes	Lack of understanding among users; Lack of commercial orientation; Poor enforcement of project rules	Lack of funding for O&M; Supply interruptions; Disputes among users	Loss of revenue; High cost of operation; No motivation to develop projects	Political pressure to subsidize O&M	Stakeholder consultation and training; Enforcement of legally binding agreements; Improve the transparency and quality of the service deliveries	Namdrik PV project in the Marshall Is
Project services do not reach target beneficiaries at national level; Lack of participation of local stakeholders and experts;	Inadequate project designs which does not recognize the PICs as the owners and the key drivers and players in regional projects	No tangible benefits from regional projects	No tangible benefits from regional project	Lack on confidence and support for regional projects; preference for bi-lateral projects	Maintain project design focus on the country team approach, focusing on actual projects on the ground, utilizing local experts and local private sector	Lome II & III Pacific Regional Energy Programs

Risk Event	Cause	Impact on			Risk Management Mitigation	Examples
		End Consumer	Intermediary	Government		
Communication problems between project PMO and national participants					and involving local communities – with regional and international experts backstopping	

Annex D: Responses to STAP Review Comments

STAP TECHNICAL REVIEW PIGGAREP Project Brief

Dr. Mark C. Trexler, Trexler Climate + Energy Services

OVERALL IMPRESSIONS

Introduction

The PIGGAREP project has an extensive history in the form of the PIREP project that has been carried out over the last two years. The magnitude of the PIREP record is such that it could not be fully reviewed in the context of this 2-day STAP review of the PIGGAREP Project Brief. To the extent possible, however, relevant materials from the PIREP review have been integrated into this STAP review.

The PIGGAREP project has laudable objectives, namely the removal of barriers to renewable energy technologies (RETs), along with numerous associated outcomes. There is no question that the widespread deployment of RETs in the PIC region would have substantial social and economic benefits (particularly in the face of rising oil prices), and would also contribute to GHG emissions reductions objectives under the UNFCCC and the Kyoto Protocol.

The PIGGAREP project, however, faces daunting challenges from geography alone. It is also a relatively small project, with its implementation spread across several years, and across eleven Pacific Island countries (PICs). Without very careful prioritization of its efforts, it is likely that the project's resources will be dissipated over activities that don't materially contribute to the project's objectives, over technologies that can't compete, and over too many countries and agencies. Instead of focusing on this kind of prioritization, however, the PIGGAREP project is also being used to fund a variety of energy policy and related activities that appear to have little direct relevance to the project's stated objectives (e.g. larger energy sector information gathering and capacity building), notwithstanding their potential larger policy value.

Relevance and Priority

This project is consistent with the GEF's development objectives by promoting the deployment of renewable energy technologies. The Project Brief's required focus on climate change and GHG emissions reductions, however, is ultimately distracting in terms of making the case for, or evaluating the likely success of, this project from an RET "barriers removal" perspective.

As asserted in the Project Brief, the project could strengthen PICs'/Alliance of Small Islands States' (AOSIS) negotiating positions in the UNFCCC and Kyoto processes, and could help demonstrate the strong commitment of the PICs to the Johannesburg Renewable Energy Coalition (JREC) of which the AOSIS is a founding member. It will also help meet the

region's commitment to the International Action Programme on RE that was adopted of the International RE Conference held in Bonn in June 2004, could help achieve Millennium Development Goals, and advance the objectives of a range of other initiatives.

Assessing the priority of this project from an impacts perspective is challenging. There is little doubt it will contribute to capacity building in the region, and to the state of energy-related knowledge in the PICs. As already noted, however, the project's implementation appears likely to be so diffuse across countries, objectives, and activities, that it could be very difficult to ultimately point to any clear accomplishments of the project with its current design.

Global Environmental Benefits and Impacts

The project is characterized as expected to result in 2 million tons of CO₂ reductions over the next ten years. While marginal from a global perspective, this would be significant in the context of PIC GHG emissions. At the same time, it is difficult to realistically assess the project's performance in this regard. First, a substantial chunk of this 2 million tons of reductions is likely to result over the next ten years from RE facilities implemented in PICs regardless of this project's outcome. Second, the Project Brief suggests that this project could reduce PIC GHG emissions by as much as 70% from a business as usual baseline by 2020. As discussed elsewhere in this review, the scale and funding of this project appears completely inadequate to accomplishing such a lofty outcome.

While RET deployment is not without potential environmental impacts, it is unlikely that the project as described here will result in environmental damage.

Project Objectives

The objective of this project is characterized as the promotion of the productive use of RE to reduce GHG emissions by removing the major barriers to the widespread and cost-effective use of feasible RETs. Associated with this primary objective is a long list associated outcomes, including the deployment of 100 MW of new RE capacity during the next five years and the reduction of CO₂ emissions by 2 million tons over the next ten years. To the extent that a significant amount of effort may focus on bringing electricity services to communities that are currently not electrified, it is unclear whether CO₂ emissions reductions will actually result. To the extent that electrification with fossil fuels is likely to gradually continue to develop across the region, however, this should not be seen as a major conceptual problem for the project.

The primary stated objective of the project, namely RET barriers removal, is certainly desirable. However the Project Brief reflects the clear conceptual challenges in focusing on RET barrier removal across the entire PIC region. Specifically, and notwithstanding two years of work through the PIREP process, the objectives do not reflect:

- A clear sense of what can be achieved in addressing systemic challenges like fossil fuel subsidies, and what the implications are for this project
- A clear sense of whether RETs can be made cost competitive, which is presumably (although not clearly stated as such) a significant barrier
- A clear sense of which RETs make the most sense to focus on in the regional context
- A clear sense of which barriers are really the most important, whether they can be overcome, and what the implications are likely to be for sustainability and replicability of project activities.

Because of the regional nature of the proposed project, it is understandably difficult to address these points in a detailed way. Without this information, however, it is not clear whether the very real challenges facing the project can be overcome.

It is possible to argue that the goal of the PIGGAREP itself is to understand the needed priorities and develop the necessary strategy as part of the implementation phase. I would question such an assertion for two reasons:

- The PIGGAREP project has already had a two-year preparatory phase in the form of the PIREP project, yet very little of the strategy development I would have expected seems to have occurred.
- There is no reference in the Project Brief itself to such an approach. The RET pricing study, for example, which would seem to be an important part of any such strategic planning, is not even scheduled to begin until the 3rd Quarter of the 2nd year of the project.

Project Activities

The project is proposed to be implemented across six different component areas, with numerous activities built in. The primary issues from the standpoint of this review involve the lack of preparatory work apparently done to prioritize and structure the PIGGAREP's activities (notwithstanding the PIREP), and the lack of a "strategy" as reflected in the Project Brief. The discussion of activities tends to reflect more of an encyclopedic approach to the barriers and related issues to be addressed, rather than a strategic approach that gives confidence in the outcomes. This is discussed in more detail below.

Scientific and Technical Soundness

The international development community has considerable experience in RE deployment. And there has been enough experience with RE technologies in the PIC region that the Project Brief is able to characterize the challenges facing its successful implementation. It is not possible to evaluate, however, how technically sound the proposed implementation plan really is.

For example, the Project Brief states:

“changes are not expected unless, first and foremost, politicians, senior government officials, investors, financiers, the civil society and the general public hear, touch, see and read financially sustainable RE projects on the ground and these projects are not only bringing about reduction in the consumption of fossil fuel but also demonstrating the productive uses of renewable energy” (emphasis in the original)

This statement suggests that an informational campaign needs to be a key element of the project. And indeed information dissemination is one of the major components of the PIGGAREP project. However, I seriously doubt that the absence of an informational campaign is, “first and foremost,” the primary barrier facing this project. This, along with the generally “scatter shot” approach of the objectives and activities, also generates questions regarding the technical soundness of the proposed approach.

Funding

The level of funding for this project is not consistent with the sheer geographic and topical scope of the project. The overall funding level is misleading, given that the large majority of the claimed funding is actually for RE installations proceeding under other programs, and it is not at all clear in the Project Brief how these installations will really contribute to the objective of removing RE barriers. It is also not possible to tell to what extent the funding is appropriately distributed (even if insufficient), given that there is no prioritization of the barriers provided.

Table A-1, “Incremental Cost Matrix in the Project Brief,” illustrates the problem associated with funding levels under this project. In the case of each project component, the “baseline funding” is characterized as accomplishing almost nothing, while the “alternative funding” is characterized as accomplishing all of the project’s objectives. Yet the incremental funding actually involved for each of the individual components is often very modest, and the claims made in this Table are simply not credible. The bottom line is that this project proposes to incrementally spend an average of approximately \$70,000 per country per year, or approximately \$10,000 per major component per country per year, to implement a very large number of activities, under very challenging circumstances. Notwithstanding the best efforts of the implementing agencies, it is not possible to see how anything close to the stated outcomes of the project will be able to be achieved with this level of funding.

Given the GHG emissions reduction objectives of the project, there should be at least some estimated costs per tonne of CO₂ reductions. Section 6 on Incremental Financing does not provide estimates of the costs of the estimated CO₂ reductions. Delineating the proper boundaries as to which costs should be included for the estimation of CO₂ costs can be problematic; should the total budget or only the GEF component be utilized or only the component causally linked to bringing about CO₂ reductions? No matter what methodology is determined appropriate, the estimated costs of the CO₂ benefits should be included in the proposal.

Replicability

There is little question that the proposed activities in the project are replicable, but whether there will be replicable successes is a very different question (as described above).

Sustainability

The Project Brief itself documents the generally unsustainable nature of many of the RET deployment efforts that have occurred in the past. The Project Brief, however, by not providing any clear indication of which barriers are really the most important to overcome with respect to success of the project, provides little evidence by which to assess the sustainability of the project. It is not clear from the Project Brief, or available supporting materials, what the demand for these technologies really is in the project area (since there is no economic analysis provided). And as previously noted, the budget available for implementation of the project does not seem suited to the task of promoting real sustainability. By attempting in some sense to do “everything, everywhere,” the project may sacrifice much of the sustainability for which it might have hoped.

Stakeholders

It is clear that there has been a major focus on stakeholder involvement during the preceding PIREP process, and in the design of this project. The quote previously cited illustrates the importance accorded in the project to the perceptions of the many potential stakeholders to the project. In my view, however, there may actually have been too much stakeholder involvement, if that contributed to the absence of a clear and prioritized strategy for accomplishing the project’s objectives.

DETAILED COMMENTS

Par 6. “Discussions with the proponents/owners of some these projects led to mutually beneficial understandings that made these projects integral parts of the proposed comprehensive regional RE project.” As a result, more than 70% of the PIGGAREP’s total budget is now made up of these projects. While there is some effort made in the Project Brief to indicate how these projects will be integrated into the project, including through monitoring and verification activities, there is not an adequate explanation of how these projects will really contribute to the removal of RET barriers.

Par 11. In introducing the topic of barriers to RET deployment, the Project Brief does not really mention the barriers that have been pivotal in other countries, including RET economics and competitiveness, lack of transmission access, and contracting issues. While the latter two of these would not be expected to be as significant for rural electrification efforts, the lack of discussion of underlying RET vs. fossil fuel economics is very puzzling. If economics are not the issue, perhaps given the very high prices for fossil fuel electricity suggested in the Regional Energy Assessment report from PIREP, this should be made much

clearer. If this were the case, it would make much clearer why there is so little attention to this and related points later in the Project Brief.

That said, much of the barriers discussion in the Project Brief almost seems to translate into an effort to reinvent the role of the private sector in energy development and deployment. Many of the elements of a successful energy infrastructure that seem to be lacking, are precisely those normally managed by private sector energy developers. Yet there is almost no discussion in the Project Brief of WHY the private sector is absent. And the inability of private sector players to make money in the renewable energy markets was not listed as a key problem in the Logical Framework Analysis worked carried out under PIREP. As a result I am left perplexed by what the role of the private sector is or should be, and what's preventing it.

Par 16. “On the other hand, the existence of national energy policies varies from ‘adopted but not enforced’ to varying stages of drafts. At the regional level, the Energy Working Group of the Council of Regional Organizations in the Pacific (CROP EWG) is presently reviewing and finalizing a Pacific Islands Energy Policy (PIEP) and a Pacific Islands Energy Strategic Action Plan (PIESAP) to be adopted by PICs Leaders through the Pacific Islands Forum. The drafts PIEP and PIESAP highlights the priority that the region places on utilizing feasible RE and energy efficiency technologies for mitigating GHG emission and supporting the region’s sustainable development effort.” Against this backdrop, it is very hard to see how a low-budget approach to RET deployment is going to work. This paragraph does make clear why a significant portion of PIGGAREP resources is to be directed to strengthening energy infrastructures and policy and the national level. But it just reinforces the sense that the barriers to successful RET deployment are in fact substantial, and requiring a significantly larger and more focused effort than the PIGGAREP project will be able to accomplish.

Par 17-26. With no discussion of the relative economics of these technologies, or their ease of implementation, etc., it is difficult to put this information into context. It would be very useful to have a matrix that qualitatively evaluates the characteristics of individual technologies against important evaluative criteria, regionally and at the country level. This would significantly assist in prioritizing RET efforts under PIGGAREP.

Par 28 a-x. The presence of so many parallel activities in the PICs makes it all the more difficult to understand how PIGGAREP, with its modest additional funding, will really change the fundamental outcomes with respect to RETs in the PIC region.

Par 30-35. The absence of prioritization (both across and within the discussion of barriers) here makes it very difficult to interpret the information.

Par 31. The discussion of market barriers is much less than what one would expect given the role of market barriers in impeding RET deployment in other parts of the world.

Par 33. “Markets in many PICs are distorted in favor of subsidized electricity and petroleum products supply. Thus RE is not allowed to compete on the basis of the real economic cost of using conventional electricity supply processes and fossil fuels.” This, together with the higher upfront costs of RETs, tends to be a key barrier to renewables around the world. Yet

if this is important in the PICs, why is the electricity pricing study not happening until years 3-4 of the PIGGAREP?

Par 33. In many countries renewable energy subsidies have been key in getting RETs deployed and making them sustainable. There is no discussion of or budget for this in the PIGGAREP. It's not clear why.

Par 33. There is no discussion of the implications for RET deployment of oil prices having almost doubled. Will it fundamentally advance PIGGAREP objectives? Solve key barriers? Or for some reason is it not that significant?

Par 39. Without a much clearer assessment of the barriers, of how PIGGAREP activities will overcome these barriers, and the resulting implications for energy sector development, the estimate that PIGGAREP will reduce fossil fuel emissions by 33-66% from the baseline case is very difficult to accept.

Par 40. "The underlying reasons for this development scenario are based on the fact that for RE to take off in the PICs, it must have the confidence and the approval rating of the decision makers, donors, investors and the general public first." This paragraph goes on to list a long set of outcomes of PIGGAREP. One outcome that is NOT listed is "an energy system in which the desired number of RETs are able to successfully and sustainably compete with fossil-fuel based alternatives." Yet without this outcome, how can RETs really claim success?

Par 43. "The proposed regional project is the first attempt in the PICs to comprehensively address the inter-related barriers to the widespread utilization of feasible RE technologies." It's not intuitively clear, however, why a comprehensive approach is necessarily the right one if the barriers and issues tend to differ substantially from country to country.

Par 51. The project will employ the following strategies:

- a. Promote hands-on project management and participation by national experts at the national level and promote closer cooperation and coordination by national stakeholders, with the regional stakeholders providing backstopping services if needed;
- b. Promote regional cooperation and intensify multi-donor and agencies cooperation;
- c. Encourage an operational focus of the project on concrete and tangible RET demonstration projects through the supply of services and support to the designated projects;
- d. Mobilize and develop regional and national capacities for mainstreaming of RE investments;
- e. Systematically generate 'bankable' project pipelines in the participating countries;
- f. Enhance knowledge management and networking nationally, regionally and internationally on RE development and utilization; and,
- g. Delivery of a package of training, technical advice and support, public awareness improvement, legislations and policies, RE resources monitoring, feasibility studies and RE system hardware installations."

There is no strategy listed, however, to "make the desired magnitude or RET deployment able to commercially compete with alternative sources of fossil fuel energy." Without this

strategy, however, can the other strategies accomplish their goals?

Par 54a. It is surprising that this kind of resource assessment would not have already occurred as part of PIREP. And it is likely that some kind of prioritization of information collection needs could significantly reduce the amount of work to be done here, without significantly affecting the outcomes.

Par 54c-2. “Based on the findings of PIREP, there are existing RE installations throughout the PICs which the project can build on as demonstration projects, each showcasing commercially feasible RE delivery mechanisms and the productive uses of RE.” It is not clear what this means. Building demonstration projects out of existing projects? Demonstrations of what?

Par 54 1) “Based on the national RE assessments findings, the project proponents and stakeholders view that the cost-effective means of addressing major technical barriers would be through the provision of much-needed capacity building and technical support for PIC energy offices, public utilities, private sector entities that are working (or are interested in working) in the energy sector, and rural folks in:” It’s simply not clear why the major technical barriers will be addressed through capacity building for PIC energy office, public utilities, and private sector entities. To make this case requires a barriers analysis that is not provided in PIGGAREP, or in the results of the PIREP.

Par 55d. “Introduction of a ‘One-Stop-Shop’ Service for RE Market Services.” It is not clear what a One-Stop-Shop for RE Market Services is.

Par 55 g. “Design and Adoption of Model Fiscal Incentives for RE Investments – This will involve the conceptualization, evaluation, development, and enforcement of appropriate fiscal incentives that would contribute to a favorable enabling environment for RE investments. Assistance will be provided in encouraging the promotion of such incentives to PIC governments for them to accept and enforce them.” Based on experience with RETs in other countries this activity could be one of the most critical of the entire PIGGAREP effort. Yet this activity has no obvious budget, is simply one of dozens of listed activities, and is only very lightly developed.

Par 56. While many of the components listed here are no doubt useful from an energy policy standpoint, they will inevitably absorb a significant portion of the budget, while providing limited contribution to the removal of RET barriers. Why should PIGGAREP be funding a detailed study on Energy Supply and Consumption in the Pacific region? How can PIGGAREP conceivably promise to prepare a national energy plan for each country?

Par 57. Several of the activities listed here seem to assume that RET investments already make investment sense, and that it is just a matter of explaining this to financial institutions and others. Yet there is no financial analysis to make this case, either in the PIGGAREP or in PIREP background materials. If this is in fact true, it should be made much clearer earlier in the Project Brief.

Par 58c 2-3. As previously noted, these electricity-pricing studies seem crucial to the goals of PIGGAREP. As such it is surprising that they were done carried out as part of the

PIRREP, and that they will not be concluded under the PIGGAREP until close to the end of the project.

Par 61. The risk analysis provided is clearly overly superficial given the rest of the discussion here.

Par 67. “Sustainability of the Regional RE Market - The financial sustainability of the project’s efforts will essentially depend on the competitiveness of RE versus conventional fossil alternatives.” This point is absolutely correct, which is why it is so surprising the whole issue of financial competitiveness is not discussed anywhere else in the Project Brief, nor in supporting PIREP documents that were reviewed for this evaluation.

CONCLUSIONS

The PIGGAREP Project Brief and its accompanying objectives reflect an extremely ambitious agenda given the history of RETs in the PICs. Given the ambitiousness of this agenda, and the geographic and other challenges that will be faced during project implementation, this review draws two primary conclusions:

- That the budget as currently proposed seems woefully inadequate to the task proposed;
- That the very careful prioritization of objectives and activities across varying PIC geographic and policy contexts, that would be needed to improve the likely performance of PIGGAREP is not reflected in the Project Brief, and does not appear to have been an output of the PIREP project.

To the extent that these two conclusions are for some reason not valid, or are the result of missing information present somewhere in the PIGGAREP record, the Project Brief should be revised to more clearly make its case.

**Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP)
Responses to STAP Review**

Comment	Reference
Introduction	
<p>Comment: The PIGGAREP project, however, faces daunting challenges from geography alone. It is also a relatively small project, with its implementation spread across several years, and across eleven Pacific Island Countries (PICs). Without very careful prioritization of its efforts, it is likely that the project’s resources will be dissipated over activities that don’t materially contribute to the project’s objectives, over technologies that can’t compete, and over too many countries and agencies.</p> <p>Response: <i>The proposed project is spread over countries with marked differences in terms of population number, renewable energy (RE) resources endowment, strengths of the local economy, attractiveness to private sector participation, local expertise and institutional structures to manage and plan the energy sector (see Annex J). It will not be practical to design a “one-fit-all” solution or strategy, and to have one common prioritization of barriers and RETs for all the PICs. The priority for resource assessment in a mountainous country would be different from that of a coral atoll. The needs of a country with many small outer islands would be different from those without. The ways of doing things in former US territories are different from the former British colonies.</i></p> <p><i>Despite the differences among the PICs, they have agreed to come to the PIGGAREP as equals – contributing equally and sharing equally. It would be impossible for the PICs to endorse a regional project whose priority is on a RE resource that is only found in 2-3 countries and is carrying out activities which are only suited for 3-4 countries.</i></p> <p><i>Due to the differences among the PICs, it is impossible to prioritize the barriers and the activities for their removal. However, it should be noted that the proposed activities (Annex I) in each participating PIC are based on the identified barriers in each PIC. Each PIC has to contend with different types of barriers depending on their national circumstances. For example, the low level of awareness on RE is a barrier throughout the PICs but it is a bigger problem in Tuvalu with its many outer islands residents than in Nauru where all of the citizens are in only one island. It is a much bigger problem in PNG with the high illiteracy rate among the population scattered in remote villages.</i></p>	<p><i>Project Brief: Annex I & Para 12</i></p> <p><i>Project Brief: Para 20</i></p>

Comment	Reference
<p><i>The overarching key barrier in all the PICs is the lack of successful installed RE systems on the ground, which are not only displacing fossil fuels but are also cost effective compared to conventional fossil fuel-based technologies. This ultimately is where the barriers relating to technical, financial, market, institutional, policy, information and awareness aspects converge.</i></p> <p><i>It should also be noted that the barriers to RE that were identified in each PIC will be addressed at the national level (and supplemented by regional interventions, where applicable) in an integrated manner. This is in recognition of the fact that the barriers are all interrelated. If the technical barriers are removed but not the financial barriers, then things will still remain as business as usual.</i></p> <p><i>Annex I shows the indicative activities for each PIC based on the findings from the National RE Assessments. These will be further reviewed and confirmed during the inception phase of the project to better reflect the priority RETs that will be considered and the key barrier removal activities that will be conducted.</i></p> <p><i>It should be emphasized that the PIGGAREP is meant mainly to remove the identified barriers in each PIC, and those that are common to all PICs, thereby helping build the conducive enabling environment that could facilitate the widespread development and utilization of the RE resources in the Pacific region. In that regard, the proposed GEF contribution would specifically be used for the barrier removal activities. It should also be noted that the proposed GEF contribution has been revised upward to USD5.225 million to incorporate additional activities, based on new information that recently became available and in response to some of the comments/recommendations of the STAP Reviewer, as well as to facilitate the accommodate the most recent participation of Nauru in the PIGGAREP. (See endorsement letter from Nauru). Nauru is a PIC whose economy is near-collapse and has the least experience with RE among the PICs. The extra resources will target the special circumstances of Nauru in 3 project components: Technical Capacity Building and Technical Support, Institutional Strengthening and Information and Awareness Enhancement.</i></p>	<p><i>Project Brief: Annex I</i></p>
<p><u>Comment:</u> Instead of focusing on this kind of prioritization, however, the PIGGAREP project is also being used to fund a variety of energy policy and related activities that appear to have little direct relevance to the project’s stated objectives (e.g. larger energy sector information gathering and capacity building), notwithstanding their potential larger policy value.</p>	
<p><u>Response:</u> <i>Among the barriers that the PICs have to contend with, the widespread development and utilization of RE (including the associated information and capacity building requirements) are those related to policies and policymaking. As previously mentioned, the barriers are closely interlinked. The absence of energy policies and plans lead to the presence of other barriers. The inherent ineffectiveness of any existing energy-related plan/policy in the PICs is also due to</i></p>	<p><i>Project Brief: Paras 17, 34 & 46</i></p>

Comment	Reference
<p><i>the absence of reliable and accurate analyzed energy sector data from which the energy plans and policies should be based upon.</i></p>	
<p>Relevance and Priority</p>	
<p><u>Comment:</u> The Project Brief’s required focus on climate change and GHG emissions reductions, however, is ultimately distracting in terms of making the case for, or evaluating the likely success of, this project from an RET “barriers removal” perspective.</p> <p><u>Response:</u> <i>The achievement of the climate change mitigation and GHG emissions reduction objectives will be through the removal of barriers to the widespread development and utilization of RE in the PICs. It should be noted that while the PICs (at least those in the government sector) are aware of the benefits of RE in supporting sustainable development, they are not able to develop and utilize their respective RE potentials because of the barriers. The approach here is to remove the barriers in order to facilitate the unhampered development and utilization of the RE resources in the PICs.</i></p> <p><i>Earlier effort to promote RE in the Pacific from an economic and rural development perspectives have not been successful. The advantage of the climate change approach in a PIC is the utilization of country team where all the concerned parties are involved and such modality does not take away the energy element of the project. The current major drive for the promotion of RE in the PICs and elsewhere in the developing world is largely based on its sustainable development and environmental benefits and this has attracted the attention and the active participation of all.</i></p> <p><u>Comment:</u> Assessing the priority of this project from an impacts perspective is challenging. There is little doubt it will contribute to capacity building in the region, and to the state of energy-related knowledge in the PICs. As already noted, however, the project’s implementation appears likely to be so diffuse across countries, objectives, and activities, that it could be very difficult to ultimately point to any clear accomplishments of the project with its current design.</p> <p><u>Response:</u> <i>Annex H shows the Annual Targets and Monitoring plan for tracking the outputs and impacts of the key PIGGAREP activities is among the important feature of the project. The M&E plan will be confirmed together with the key stakeholders during the project’s inception phase, based on the identified success indicators and means of verification for the project goal, purpose, outcomes, and outputs. Annex H shows the key impact parameters (e.g., GHG emissions reduction,</i></p>	<p><i>Project Brief: Annex B</i></p> <p><i>Project Brief: Para 68</i></p> <p><i>Project Brief: Annex H</i></p>

Comment	Reference
<p><i>additional installed RE-based energy system capacity, etc) and the annual targets that will be monitored during the course of implementation of the PIGGAREP. With the support the PICs, their respective country teams, the Project Advisory Committee, SPREP and the UNDP, it is envisioned that such M&E would be designed taking into consideration the daunting challenges of tracking the impacts of PIGGAREP.</i></p>	
Global Environmental Benefits and Impacts	
<p>Comment: It is difficult to realistically assess the project’s performance in this regard. First, a substantial chunk of this 2 million tons of reductions is likely to result over the next ten years from RE facilities implemented in PICs regardless of this project’s outcome. Second, the Project Brief suggests that this project could reduce PIC GHG emissions by as much as 70% from a business as usual baseline by 2020. As discussed elsewhere in this review, the scale and funding of this project appears completely inadequate to accomplishing such a lofty outcome.</p> <p>Response: <i>It should be emphasized that the proposed project budget includes the cost of the baseline activities and the cost of removing the key barriers to widespread RE development and utilization. The baseline activities, for example the designated demonstration activities are already funded from some other sources. The GEF contribution is for the supplementary activities that are meant to remove the barriers. At the end of the proposed project the favorable enabling environments would have been set in place and operationalized to facilitate the application of RETs both for energy and non-energy purposes.</i></p> <p><i>Regarding the target values, Annex G shows an estimated potential 6.5 million CO2 emissions reduction by 2020. The PIGGAREP is based on a very conservative estimate of only 2 million tons CO₂ by 2015. Hence, the anticipated GHG reduction is not based on the project budget only. The proposed GEF-assisted project is only for 5 years. However, its impacts in terms of activating the market, enabling the availability of capital, maintaining confidence, etc. will facilitate more funds to be spend on RE so as to be able to achieve this 2 million tons CO₂ emissions reduction target 5 years after the project.</i></p>	<p><i>Project Brief: Annex G</i></p>
Project Objectives	
<p>Comment: To the extent that a significant amount of effort may focus on bringing electricity services to communities that are currently not electrified, it is unclear whether CO2 emissions reductions will actually result. To the extent that electrification with fossil fuels is likely to gradually continue to develop across the region, however, this should not be seen as a major conceptual problem for the project.</p> <p>Response: <i>Bringing electricity to the almost 70% of the people in the PICs without access to it is a key development challenge for each PIC government. Fossil fuel-based</i></p>	<p><i>Project Brief:</i></p>

Comment	Reference
<p><i>include a regional activity on RE Electricity Pricing Study, which will involve the conduct of an electricity tariff pricing study for electricity generated using RE. It is intended to further investigate and evaluate various options for financial incentives to encourage RE-based power projects, including capacity and energy payment and investment incentives. A model for electricity pricing with environmental impact costing will also be developed.</i></p>	
<p>Project Activities</p>	
<p>Comment: The project is proposed to be implemented across six different component areas, with numerous activities built in. The primary issues from the standpoint of this review involve the lack of preparatory work apparently done to prioritize and structure the PIGGAREP’s activities (notwithstanding the PIREP), and the lack of a “strategy” as reflected in the Project Brief. The discussion of activities tends to reflect more of an encyclopaedic approach to the barriers and related issues to be addressed, rather than a strategic approach that gives confidence in the outcomes.</p> <p>Response: <i>The issue of prioritization has been responded to in 2 or 3 instances in previous comments. Regarding the lack of strategy, as mentioned earlier Para 15 states what is the intended project strategy. It is not clear, whether the reviewer is saying that the proposed strategy is not acceptable or not. As can be inferred from the other comments, there seems to be a difference in view regarding what should be the focus of this project. Of course this OP-6 project will be addressing barriers and the proposed activities have been strategically identified to realize the expected outcomes. As far as the project team is concerned, the activities are based on the logical framework analysis that was carried out, which identified the project goal, purpose, outcomes and outputs, as reflected in the project planning matrix (PPM) in Annex B. The proposed activities are based on the PPM and are intended to realize the outputs, whose achievement contributes to the realization of the outcomes.</i></p> <p><i>The way the activities that were identified may have been presented in an encyclopaedic manner. Nonetheless, they are based on the results of the PIREP activities, as well as other similar or related activities that are ongoing and/or previously carried out in the Pacific region. As already mentioned several times, Annex I presents the indicative activities that will be carried out in each PIC, depending on the findings and recommendations of the National RE Assessments. These will be finalized during the inception phase of the project.</i></p>	<p><i>Project Brief: Para 12; Annex B</i></p>
<p>Scientific and Technical Soundness</p>	
<p>Comment: It is not possible to evaluate, however, how technically sound the proposed implementation plan really is. For example, the Project Brief states: “changes are not expected unless, first and foremost, politicians, senior government officials, investors, financiers, the civil society and the general public hear, touch, see and read financially sustainable RE projects on the ground and</p>	

Comment	Reference
<p>these projects are not only bringing about reduction in the consumption of fossil fuel but also demonstrating the productive uses of RE” (emphasis in the original) This statement suggests that an informational campaign needs to be a key element of the project. And indeed information dissemination is one of the major components of the PIGGAREP project. However, I seriously doubt that the absence of an informational campaign is, “first and foremost,” the primary barrier facing this project. This, along with the generally “scatter shot” approach of the objectives and activities, also generates questions regarding the technical soundness of the proposed approach.</p> <p>Response: <i>It must be emphasized once more that the proposed objectives and activities of the PIGGAREP are based on the logical framework analysis that was carried out under PIREP, which identified the project goal, purpose, outcomes and outputs, as reflected in the project planning matrix (PPM) in Annex B. Hence, this is not a “scatter shot” approach in identifying the project objectives and activities.</i></p> <p><i>The quoted statement actually strengthens the very strong interlink ages among the barriers and somehow highlights the near-impossibility of ranking one over the other. It also strengthens PIGGAREP’s strategy of comprehensively dealing with all the barriers rather than addressing only some and leaving out others thereby getting only minimal impacts.</i></p> <p><i>The statement captures all the interlinked efforts that must be put in place in order to reverse the business as usual. It implies that there must be some real commercially successful and economically competitive projects on the ground, not a successful project on paper only. A successful project on the ground is characterized by the fact that the PIGGAREP has helped the PIC to conduct the resource assessment correctly, that the feasibility study was properly done, the selection of the hardware equipment was correct and the management of the contractual matters of the project was right, the institutional set-up is working fine, the recipient community is cooperating, local technicians have been trained, maintenance services are reliable, spare parts are readily available, the financial affairs of the project is safe and sound, etc. Based on surveys conducted in previous projects in some of the PICs, if the people in the countries become more aware and become convinced about the benefits of RE applications, more interest in investing in RE-based energy system projects can be expected, banks will be supporting such projects, and would support moves to come up with more funding for such efforts. The expected multiplier effect of having successful RE installations on the ground will define the projects sustainability and replicability. Para 40 has been revised mentioning the above arguments.</i></p>	<p><i>Project Brief: Para 12 and Annex B.</i></p> <p><i>Project Brief: Para 40</i></p>
Funding	
<p>Comment: The level of funding for this project is not consistent with the sheer geographic and topical scope of the project. The overall funding level is misleading, given that the large majority of the claimed funding is actually for RE installations</p>	

Comment	Reference
<p>proceeding under other programs, and it is not at all clear in the Project Brief how these installations will really contribute to the objective of removing RE barriers. It is also not possible to tell to what extent the funding is appropriately distributed (even if insufficient), given that there is no prioritization of the barriers provided.</p> <p>Response: <i>GEF project funds will not be used for the RE system hardware that will be used in the designated demonstrations. The RET demonstration activities are among the co-financed baseline activities of the PIGGAREP, which are part and parcel of the project. A lot of the barrier removal activities will revolve around these RE system demonstrations since having successful RE installations on the ground is key to bringing forth multiplier effects, which would support the sustainability and replicability of the project.</i></p> <p><i>Once again, it should be emphasized that the GEF contribution are intended only for the barrier removal activities except for the confirmed co-financed (budgeted) demonstration activities, which are also among the project’s barrier removal activities. The project budget (baseline and incremental) is not intended to finance the expected RE-based energy system projects that will be influenced and/or induced by the PIGGAREP.</i></p> <p><i>Considering recently available information, and some of the budget-related comments of the STAP Reviewer, and the recent participation of Nauru in the project, the project budget has been revised upward to US\$ 5.225 million.</i></p> <p>Comment: Table A-1, “Incremental Cost Matrix in the Project Brief,” illustrates the problem associated with funding levels under this project. In the case of each project component, the “baseline funding” is characterized as accomplishing almost nothing, while the “alternative funding” is characterized as accomplishing all of the project’s objectives. Yet the incremental funding actually involved for each of the individual components is often very modest, and the claims made in this Table are simply not credible. The bottom line is that this project proposes to incrementally spend an average of approximately \$70,000 per country per year, or approximately \$10,000 per major component per country per year, to implement a very large number of activities, under very challenging circumstances. Notwithstanding the best efforts of the implementing agencies, it is not possible to see how anything close to the stated outcomes of the project will be able to be achieved with this level of funding.</p> <p>Response: <i>Baseline funding will be used for activities that the PICs will do in the area of RE development and utilization even without the GEF assistance. For example, even without the GEF support, the identified/designated demonstration activities will go on, and achieve (assuming they are properly managed and implemented) what their intended objectives are. Hence, it is not correct to say that the baseline activities will not accomplish anything. Yes it is correct to say that the alternative</i></p>	<p><i>Project Brief: Paras 6 and 28</i></p> <p><i>Project Brief: Para 28</i></p> <p><i>Project Brief: Para 95 (Table); Annex A-5 (tables)</i></p>

Comment	Reference
<p><i>funding, which is for the entire project, is supposed to achieve all of the project's objectives. The incremental funding – which are only for the barrier removal activities – is indeed modest compared to the other co-funded activities (i.e., baseline activities).</i></p> <p>The funding allocations would not necessarily be equal for each PIC inasmuch as the magnitude of the incremental activities that will be carried out in each would obviously not be the same. However, for the sake of discussion, if an US\$ 70K allocation will be provided to each PIC, such would just be for the incremental activities. The other activities (i.e., baseline activities) are already funded from other sources, either from the donor agency that funds the designated demonstration activity or from the government or from the private sector. It will be impossible to implement all the project activities and achieved the expected outcomes with these amounts of funds, and we agree with the reviewer that the descriptions provided in the IC Matrix are not credible if indeed we intend to achieve these using only the incremental funds from GEF. But that is not the case here. The amounts stated are only for the incremental activities.</p> <p>Comment: Given the GHG emissions reduction objectives of the project, there should be at least some estimated costs per tonne of CO₂ reductions. Section 6 on Incremental Financing does not provide estimates of the costs of the estimated CO₂ reductions. Delineating the proper boundaries as to which costs should be included for the estimation of CO₂ costs can be problematic; should the total budget or only the GEF component be utilized or only the component causally linked to bringing about CO₂ reductions? No matter what methodology is determined appropriate, the estimated costs of the CO₂ benefits should be included in the proposal.</p> <p>Response: <i>Considering the GEF contribution, and the resulting CO₂ emissions reduction 5 years after the project, the unit abatement cost of this project is about US\$ 2.5/ton CO₂.</i></p>	<p><i>Project Brief: Annex A-1</i></p> <p><i>Project Brief: Annex A – A.5</i></p>
<p>Replicability</p>	
<p>Comment: There is little question that the proposed activities in the project are replicable, but whether there will be replicable successes is a very different question (as described above).</p> <p>Response: <i>Replicability (and sustainability) would very much dependent on whether the project will be able to showcase successful RE-based energy system projects on the ground.</i></p>	<p><i>Project Brief: Para 6, 28 and 73</i></p>

Comment	Reference
Sustainability	
<p>Comment: The Project Brief itself documents the generally unsustainable nature of many of the RET deployment efforts that have occurred in the past. The Project Brief, however, by not providing any clear indication of which barriers are really the most important to overcome with respect to success of the project, provides little evidence by which to assess the sustainability of the project. It is not clear from the Project Brief, or available supporting materials, what the demand for these technologies really is in the project area (since there is no economic analysis provided). And as previously noted, the budget available for implementation of the project does not seem suited to the task of promoting real sustainability. By attempting in some sense to do “everything, everywhere,” the project may sacrifice much of the sustainability for which it might have hoped.</p> <p>Response: <i>The issue of prioritization of the barriers is again being raised, and in response to this, the project team suggests reference to its previous response to this. In addition, it should be noted that the type of projects that will be demonstrated (as part of the PIGGAREP barrier removal activities) in some of the PICs are on the applicable (and somehow refers to the priority) RET in these countries. As previously mentioned, because of the national circumstances of the PICs (particularly on RE resource endowments), each would have different applicable RETs. As demonstration projects, these are meant to showcase the proper design, development, engineering, financing, operation, maintenance, monitoring and evaluation of RE-based energy system projects. These will also showcase the “business angle” of RE-based energy system projects. In that regard, these demonstration projects that are funded from other courses, are also considered barrier removal activities, inasmuch as the successful demonstrations would contribute to the elimination of many of the identified barriers. GEF funds, may, if needed be provided for supplementary technical assistance in the design and implementation of these demonstration projects, or in the removal of any other barriers to the implementation of such demonstration projects.</i></p> <p><i>Sustainability is dealt with in two aspects, as described in the Project Brief; (1) sustainability of the institutional set up to ensure continued deployment of successful RETs; and, (2) sustainability of the operations of existing and planned RE-based energy system installations on the ground (demonstration projects).</i></p>	<p><i>Project Brief: Paras 6, 12, 28; Annex I</i></p> <p><i>Project Brief: Paras 62-66 and 68</i></p>
Stakeholders	
<p>Comment: It is clear that there has been a major focus on stakeholder involvement during the preceding PIREP process, and in the design of this project. The quote previously cited illustrates the importance accorded in the project to the perceptions of the many potential stakeholders to the project. In my view, however, there may actually have been too much stakeholder involvement, if that contributed to the absence of a clear and prioritized strategy for accomplishing the project’s</p>	

Comment	Reference
<p>objectives.</p> <p>Response: <i>Stakeholder consultations and consensus building is a major focus of the PIGGAREP development process, which was emphasized in the conduct of the LFA exercise. While there were some discussions/debates (which are expected in highly democratic participatory process) that ensued during the process, in the end the stakeholders were able to come up with a project design (based on the LFA process) that was all agreed by them. This was also officially confirmed during the September 2004 Annual Meeting in Tahiti.</i></p>	<p><i>Project Brief: Paras 75 & 12.</i></p>

Detailed Comments

Comment	Reference
<p><u>Comment:</u> Par 6. “Discussions with the proponents/owners of some these projects led to mutually beneficial understandings that made these projects integral parts of the proposed comprehensive regional RE project.” As a result, more than 70% of the PIGGAREP’s total budget is now made up of these projects. While there is some effort made in the Project Brief to indicate how these projects will be integrated into the project, including through monitoring and verification activities, there is not an adequate explanation of how these projects will really contribute to the removal of RET barriers.</p> <p><u>Response:</u> <i>As previously stated, RETs will only gain full acceptability if these are successfully demonstrated. In the context of the Pacific, not only will the technology be demonstrated, but will also demonstrate how the applicable RETs can be sustainably designed, engineered, financed, operated and maintained, especially as a commercial venture. In that sense, the demonstration project themselves serve as a means of contributing to the removal of some of the key technical, institutional, financing, and market development barriers to widespread RET applications in the PICs. As demonstration projects, these are meant to showcase the proper design, development, engineering, financing, operation, maintenance, monitoring and evaluation of RE-based energy system projects, as well as showcase the “business angle” of RE-based energy system projects. The successful demonstrations would contribute to the removal of many of the identified barriers.</i></p> <p><i>It should be emphasized that the demonstration projects will assist to remove one overarching barriers in all the PICs, i.e., the absence of successful RE-based energy system installations on the ground.</i></p> <p><i>Paragraph 6 has been elaborated further to highlight how these projects contribute to the removal of some of the barriers.</i></p>	<p><i>Project Brief: Para 6, 17,28, & 40</i></p>
<p><u>Comment:</u> Par 11. In introducing the topic of barriers to RET deployment, the Project Brief does not really mention the barriers that have been pivotal in other countries, including RET economics and competitiveness, lack of transmission access, and contracting issues. While the latter two of these would not be expected to be as significant for rural electrification efforts, the lack of discussion of underlying RET vs. fossil fuel economics is very puzzling. If economics are not the issue, perhaps given the very high prices for fossil fuel electricity suggested in the Regional Energy Assessment report from PIREP, this should be made much clearer. If this were the case, it would make much clearer why there is so little attention to this and related points later in the Project Brief.</p> <p><u>Response:</u></p>	

Comment	Reference
<p>paragraph does make clear why a significant portion of PIGGAREP resources is to be directed to strengthening energy infrastructures and policy and the national level. But it just reinforces the sense that the barriers to successful RET deployment are in fact substantial, and requiring a significantly larger and more focused effort than the PIGGAREP project will be able to accomplish.</p> <p>Response: <i>The PIGGAREP represents an integrated effort to create the right environment for RE to be a sustainable, cost-effective and a competitive alternative to fossil fuel-based energy technologies for supporting national economic development in the PICs. If the reviewer is thinking that the proposed GEF contribution will also be used for the investments required to realize the 100 MW RE-based energy system installations, the conclusion that this project is low-budgeted is correct. But that is not the case. What is being regarded here as measly GEF contribution is intended for the barrier removal activities, that would indirectly influence future RET deployment. It would be wrong to think that the GEF contribution would be used to directly support RET deployment</i></p>	<p><i>Project Brief: Para 6</i></p>
<p>Comment: Par 17-26. With no discussion of the relative economics of these technologies, or their ease of implementation, etc., it is difficult to put this information into context. It would be very useful to have a matrix that qualitatively evaluates the characteristics of individual technologies against important evaluative criteria, regionally and at the country level. This would significantly assist in prioritizing RET efforts under PIGGAREP.</p> <p>Response: <i>As mentioned previously, the prioritization of RETs to be considered in the PIGGAREP was not done, because such can only be done individually in each PIC. The RET demonstration in some of the PICs could considered as a reflection of the prioritization of the RETs. If need be, the prioritization can be based on their availability and extent of potential GHG reduction. Prioritization based on economics and ease of implementation was outside the scope of the PIREP studies and will be conducted in the PIGGAREP.</i></p>	<p><i>Project Brief: Paras 58.B-3, 54.C-1, C-2, C-3 & C-7</i></p>
<p>Comment: Par 28 a-x. The presence of so many parallel activities in the PICs makes it all the more difficult to understand how PIGGAREP, with its modest additional funding, will really change the fundamental outcomes with respect to RETs in the PIC region.</p> <p>Response: <i>These parallel activities will give the PIGGAREP more meaning. Some of these parallel activities are actually part and parcel of the PIGGAREP. They are actually the demonstration activities of the PIGGAREP. They are integral parts of the project.</i></p>	<p><i>Project Brief: Paras 6, 28, 40 & 58.C-2</i></p>
<p>Comment: Par 30-35. The absence of prioritization (both across and within the discussion of barriers) here makes it very difficult to interpret the information.</p>	

Comment	Reference
<p><u>Response:</u> <i>Please refer to responses on this issue of prioritization.</i></p>	
<p><u>Comment:</u> Par 31. The discussion of market barriers is much less than what one would expect given the role of market barriers in impeding RET deployment in other parts of the world.</p> <p><u>Response:</u> <i>How detail one can be? The barriers discussion can be expounded further if necessary. More details of all the barriers are in the assessment reports, the report on the “business angle” of RE-based energy systems projects, financing mechanisms and technical support program reports.</i></p>	
<p><u>Comment:</u> Par 33. “Markets in many PICs are distorted in favor of subsidized electricity and petroleum products supply. Thus RE is not allowed to compete on the basis of the real economic cost of using conventional electricity supply processes and fossil fuels.” This, together with the higher upfront costs of RETs, tends to be a key barrier to renewables around the world. Yet if this is important in the PICs, why is the electricity pricing study not happening until years 3-4 of the PIGGAREP?</p> <p><u>Response:</u> As mentioned earlier, there are available studies on RE electricity pricing that have been carried in some of the PICs and these were used in the PIGGAREP design, particularly on activities that relates to financing and market barriers. Adjustments have been made on the project schedule to consider this very important suggestion.</p> <p><u>Comment:</u> Par 33. In many countries RE subsidies have been key in getting RETs deployed and making them sustainable. There is no discussion of or budget for this in the PIGGAREP. It’s not clear why.</p> <p><u>Response:</u> <i>Subsidies are such an unsustainable option that the PIGGAREP does not intend to pursue. This decision was arrived at during the LFA exercise, and the issue of subsidies has been highlighted as among the barriers to RET deployments in the Pacific. Proxy options to subsidies can be in various forms and can target different groups, consumers, manufacturers, RESCOs, etc. These will be further studied and verified in the PIGGAREP, as part of the policy barrier removal activities.</i></p> <p><u>Comment:</u> Par 33. There is no discussion of the implications for RET deployment of oil prices having almost doubled. Will it fundamentally advance PIGGAREP objectives? Solve key barriers? Or for some reason is it not that significant?</p>	<p><i>Project Brief: Para 33 and Annex F</i></p> <p><i>Project Brief: Paras 33.a, 55 G & 58</i></p>

Comment	Reference
<p><u>Response:</u> <i>One of the features of the business-as-usual scenario is an increasing dependence on imported energy, which will continue to contribute to significant current account deficits and to a high vulnerability of PICs with respect to price shocks in the world energy markets.</i></p>	<p><i>Project Brief: Para 37b</i></p>
<p><u>Comment:</u> Par 39. Without a much clearer assessment of the barriers, of how PIGGAREP activities will overcome these barriers, and the resulting implications for energy sector development, the estimate that PIGGAREP will reduce fossil fuel emissions by 33-66% from the baseline case is very difficult to accept.</p> <p><u>Response:</u> The 15 national RE assessment reports provide detailed assessment of the barriers in each PIC. The proposed activities, which are aimed at removing the identified barriers, are based on the findings of, and recommendations of, these assessments. As described earlier, these barrier removal activities, when successfully carried out, will bring about the enabling environment for, and facilitates, the widespread application of RETs.</p> <p><i>The target emission reduction in the PIGGAREP is conservatively placed at 2 million tons by 2015 (calculated total is about 2.55 million). By project end, the estimated CO2 emissions reduction is about 0.04 million tons based on an installed RE-based energy system capacity of 50 MW. The project team, based on the findings from the national RE assessments, believes that the estimated level of CO2 emissions reduction is technically achievable. To ensure this, the barriers must be addressed in an integrated and comprehensive manner. If the PIGGAREP will only focus on one or two barriers then the impacts will be minimal, the business as usual scenario would still remain. There is no better and more effective marketing and awareness strategy than the demonstration activities is in the context of the PICs.</i></p>	<p><i>Project Brief: Paras 6, 12, 53,54</i></p> <p><i>Project Brief: Annex G</i></p>
<p><u>Comment:</u> Par 40. “The underlying reasons for this development scenario are based on the fact that for RE to take off in the PICs, it must have the confidence and the approval rating of the decision makers, donors, investors and the general public first.” This paragraph goes on to list a long set of outcomes of PIGGAREP. One outcome that is NOT listed is “an energy system in which the desired number of RETs are able to successfully and sustainably compete with fossil-fuel based alternatives.” Yet without this outcome, how can RETs really claim success?</p> <p><u>Response:</u> <i>The term energy system is not very clear. What does it mean? If it means that a regulatory framework that will be supportive to RE-based energy system initiatives, then that is among the expected outcomes as referred to in Para 40 e, which is strengthened legal and regulatory, planning and coordination structures for the mitigation of GHG through the widespread utilization of RE. Obviously,</i></p>	<p><i>Project Brief: Para 40.e</i></p>

Comment	Reference
<p><i>such regulatory or legal framework would ensure level playing field for RETs allowing them to successfully and sustainably compete with fossil fuel-based alternatives. This has been clarified further in the Project Brief.</i></p>	
<p>Comment: Par 43. “The proposed regional project is the first attempt in the PICs to comprehensively address the inter-related barriers to the widespread utilization of feasible RE technologies.” It’s not intuitively clear, however, why a comprehensive approach is necessarily the right one if the barriers and issues tend to differ substantially from country to country.</p> <p>Response: <i>It is comprehensive in the sense that the PIGGAREP will address all the barriers at the same time since they are interrelated. Earlier initiatives partly addressed the barriers (at the most 2 to 3 barriers) and so their impacts were minimal.</i></p>	<p><i>Project Brief: Paras 46 & 55.g</i></p>
<p>Comment: Par 51. The project will employ the following strategies:</p> <ul style="list-style-type: none"> a. Promote hands-on project management and participation by national experts at the national level and promote closer cooperation and coordination by national stakeholders, with the regional stakeholders providing backstopping services if needed; b. Promote regional cooperation and intensify multi-donor and agencies cooperation; c. Encourage an operational focus of the project on concrete and tangible RET demonstration projects through the supply of services and support to the designated projects; d. Mobilize and develop regional and national capacities for mainstreaming of RE investments; e. Systematically generate ‘bankable’ project pipelines in the participating countries; f. Enhance knowledge management and networking nationally, regionally and internationally on RE development and utilization; and, g. Delivery of a package of training, technical advice and support, public awareness improvement, legislations and policies, RE resources monitoring, feasibility studies and RE system hardware installations.” <p>There is no strategy listed, however, to “make the desired magnitude or RET deployment able to commercially compete with alternative sources of fossil fuel energy.” Without this strategy, however, can the other strategies accomplish their goals?</p> <p>Response: <i>Para 55 is meant to encompass the proposed strategy. However, to make this clearer, the project team agrees to state this suggested strategy, i.e., “make the desired magnitude or RET deployment able to commercially compete with alternative sources of fossil fuel energy” clearly in the list.</i></p>	<p><i>Project Brief: Para 55. h</i></p>
<p>Comment: Par 54a. It is surprising that this kind of resource assessment would not have</p>	

Comment	Reference
<p>already occurred as part of PIREP. And it is likely that some kind of prioritization of information collection needs could significantly reduce the amount of work to be done here, without significantly affecting the outcomes.</p> <p>Response: <i>Resources assessments were preliminarily done in the PIREP to come up with an order-of-magnitude estimate of the RE resources. These are based on desk research and <u>available reliable</u> information national counterparts (i.e., PIREP Teams) are <u>able</u> to provide. The data gathering did not include actual resource measurements. The US\$ 700K budget for the project preparatory activities would not suffice to allow for such detailed assessments. Annex J provides a sampling of the data available from the PICs. It would require a significant amount of time and money to do these resources assessment studies.</i></p> <p>Comment: Par 54c-2. “Based on the findings of PIREP, there are existing RE installations throughout the PICs which the project can build on as demonstration projects, each showcasing commercially feasible RE delivery mechanisms and the productive uses of RE.” It is not clear what this means. Building demonstration projects out of existing projects? Demonstrations of what?</p> <p>Response: <i>As described earlier, the demonstration projects are meant to showcase or demonstrate the design, development, engineering, financing, operation, maintenance, monitoring and evaluation of sustainable and commercially viable RE-based energy system projects. The “business angle” of such projects will be demonstrated. Some of these demonstration projects have their original objective of just demonstrating the technology involved. However, with the permission of the project owners, certain aspects these projects were redesigned to make them more sustainable. Some are designed to apply certain RE delivery mechanism. Such modified RE projects (which are now considered as part of the PIGGAREP), will showcase the modified delivery mechanisms, which are considered more sustainable, and/or supportive of productive uses. The integration of these modified projects into the PIGGAREP is what is referred to in the phrase “RE installations throughout the PICs, which the project can build on as demonstration projects.” Such demonstrations are also meant to contribute to the removal of technical, market, finance, policy, institutional and awareness barriers, and that these will operate sustainably and cost competitively against fossil fuel-based systems.</i></p>	<p><i>Project Brief: Para 58.A; Annex J</i></p> <p><i>Project Brief: Para 6</i></p>
<p>Comment: Par 54 1) “Based on the national RE assessments findings, the project proponents and stakeholders view that the cost-effective means of addressing major technical barriers would be through the provision of much-needed capacity building and technical support for PIC energy offices, public utilities, private sector entities that are working (or are interested in working) in the energy sector, and rural folks in.” It’s simply not clear why the major technical barriers will be addressed through capacity building for PIC energy office, public utilities, and private sector entities.</p>	

Comment	Reference
<p>To make this case requires a barriers analysis that is not provided in PIGGAREP, or in the results of the PIREP.</p> <p>Response: <i>The technical barriers are described in detail in the national assessment reports. Most of these technical barriers refer to the lack or inadequate capacity of energy offices, public utilities, private sector, etc., in dealing with the technical aspects of RET promotion and applications. These would include design of RE-based energy systems, technical evaluation of RET application projects, RE resource assessments, technical capacity in the inspection and evaluation of the performance of such systems, operation and maintenance of RET systems, etc. In the case of the energy offices, improving their technical capacity on RETs would help them play an active role in the development and utilization of RE resources, and minimize the need for external consultants whose services would usually be engaged to carry out such roles.</i></p>	<p><i>Project Brief: Paras 58.b, 63.g</i></p>
<p>Comment: Par 55d. “Introduction of a ‘One-Stop-Shop’ Service for RE Market Services.” It is not clear what a One-Stop-Shop for RE Market Services is.</p> <p>Response: <i>A RE “one-stop-shop” service is provided for prospective RE project developers and implementers to expedite processing and implementation of RE projects. This is to address for example the sometimes long-winded process of applying for permits to develop and implement RE projects, which usually de-motivate prospective project developers. All required requirements could be facilitated in such service. In some countries, the services could include project feasibility analysis, design, and other related technical assistance.</i></p>	
<p>Comment: Par 55 g. “Design and Adoption of Model Fiscal Incentives for RE Investments – This will involve the conceptualization, evaluation, development, and enforcement of appropriate fiscal incentives that would contribute to a favorable enabling environment for RE investments. Assistance will be provided in encouraging the promotion of such incentives to PIC governments for them to accept and enforce them.” Based on experience with RETs in other countries this activity could be one of the most critical of the entire PIGGAREP effort. Yet this activity has no obvious budget, is simply one of dozens of listed activities, and is only very lightly developed</p> <p>Response: <i>Item A-5 in Annex A includes several budget tables. The last one shows the budget cost sharing between GEF and the co-financiers of the full-scale project by components/activities, and for this activity the budget indicated is US\$ 90,000.</i></p>	<p><i>Project Brief: Annex A (Item B3.2)</i></p>
<p>Comment: Par 56. While many of the components listed here are no doubt useful from an energy policy standpoint, they will inevitably absorb a significant portion of the budget, while providing limited contribution to the removal of RET barriers. Why should PIGGAREP be funding a detailed study on Energy Supply and</p>	

Comment	Reference
<p>Consumption in the Pacific region? How can PIGGAREP conceivably promise to prepare a national energy plan for each country?</p> <p>Response: <i>As has been stated previously in several instances in this review, there is presently a dearth in data on energy supply and consumption data in the PICs. RE is among the energy resource that some PICs are now using, and others can potentially use. RE resources used in the country have to be accounted for in a national energy plan. Good, effective national energy plans and policies are based on accurate data. The absence of national energy plans (and the lack of capacity to prepare such plan) is clearly something that poses also as a barrier to RE development and utilization in PICs. The project development team expects about US\$ 80,000 supplemental funds from GEF for this incremental activity.</i></p>	<p><i>Project Brief: Para 56 C; Annex J</i></p>
<p>Comment: Par 57. Several of the activities listed here seem to assume that RET investments already make investment sense, and that it is just a matter of explaining this to financial institutions and others. Yet there is no financial analysis to make this case, either in the PIGGAREP or in PIREP background materials. If this is in fact true, it should be made much clearer earlier in the Project Brief.</p> <p>Response: <i>There have been several attempts to educate the financial sector in the PICs about the technical and financial viability of RET application projects. However, this sector is also among those that want to see existing, working and proven feasible (considering the general physical, economic and socio-cultural conditions in the PICs) RET application projects on the ground. From information learned from previous information awareness campaigns, training courses/workshops, and from other media, about successful commercially viable RET application projects in other regions, they are somehow aware of the benefits of RETs. But they just have to see these working in the region to encourage them to support RET application initiatives. Under PIGGAREP, the feasibility studies and evaluations will be carried out for the designated demonstration projects to confirm the economics of the RET investments.</i></p>	<p><i>Project Brief: Paras 32.c, 33.a & b; 40</i></p>
<p>Comment: Par 58c 2-3. As previously noted, these electricity-pricing studies seem crucial to the goals of PIGGAREP. As such it is surprising that they were done carried out as part of the PIRREP, and that they will not be concluded under the PIGGAREP until close to the end of the project.</p> <p>Response: <i>These studies were not part of the PIREP and would require more time and resources. However, as mentioned earlier, the PIGGAREP design has also made use of other similar studies in other PICs (e.g., Fiji). The project schedule has been revised to reflect an earlier implementation of these studies.</i></p>	<p><i>Project Brief: Para 62 C.2 & 3 Annex F</i></p>
<p>Comment: Par 61. The risk analysis provided is clearly overly superficial given the rest of the discussion here.</p>	

Comment	Reference
<p><u>Response:</u> <i>The general risks that were listed in the Table in Para 66 are what the project development team has identified with the stakeholders during the national consultations and in the LFA. These are the risks that are more or less common to all PICs. The project development team assumes that the items/issues mentioned in this review as apparent shortcoming of the PIGGAREP designed have been adequately responded to, and therefore are not considered as probable risks to the successful implementation of the proposed PIGGAREP.</i></p>	<p>Project Brief: Para 66</p>
<p><u>Comment:</u> Par 67. “Sustainability of the Regional RE Market - The financial sustainability of the project’s efforts will essentially depend on the competitiveness of RE versus conventional fossil alternatives.” This point is absolutely correct, which is why it is so surprising the whole issue of financial competitiveness is not discussed anywhere else in the Project Brief, nor in supporting PIREP documents that were reviewed for this evaluation.</p> <p><u>Response:</u> <i>Competitiveness will depend on future oil prices and costs of RETs. PIGGAREP will not be able to influence the future oil prices. However, PIGGAREP is the PIC’s coordinated attempt to influence, albeit indirectly, the costs of RETs in the region. The enabling environments that would help facilitate the widespread utilization of RETs in the region could possibly have an influence in the RET costs in the future. Oil-based and RE-based energy systems can fairly compete if there is a level playing field – which is among the objectives that the PIGGAREP is aiming to achieve.</i></p>	<p><i>Project Brief: Paras 28, 31.a, 33.a &b, 37.i, 40, 62.c-2 & 3, and 72</i></p>

Annex E: Letter of Endorsements

Please find separate file containing the individual Letter of Endorsements from Cook Islands, Fiji, Kiribati, Nauru, Nuie, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

Annex F: Schedule of Project Activities

No	COMPONENTS/ACTIVITIES	Year 1				Year 2				Year 3				Year 4				Year 5			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
A	TECHNICAL CAPACITY DEVELOPMENT AND TECHNICAL SUPPORT																				
A1	RE Resources Assessment																				
A1.1	Development of a RE Resource Assessment Methodology			x	x																
A1.2	Conduct of RE resources survey:																				
A1.2a	Production of a Pacific Wind and Solar Maps / Atlas					x	x	x	x	x	x	x									
A1.2b	Biomass resource assessment					x	x	x	x	x	x	x									
A1.2c	Geothermal resource assessment									x	x	x	x	x	x	x	x				
A1.2d	Hydro resource assessment					x	x	x	x	x	x	x									
A1.3	Design and development of a Regional RE Resource Database																				
A1.4	Development of a RE Resource Monitoring and Simulation Methodology				x	x	x	x	x												
A1.5	Conduct of capacity building program on RE resources assessment			x			x			x					x						
A2	Technical Support																				
A2.1	Evaluation of the viability and requirements for the development of local RE service industry					x	x	x													
A2.2	Training course on the design, feasibility evaluation, O&M of RE systems				x			x				x									
A2.3	Assessment of other value-added applications of RE resources					x	x														
A2.4	Evaluation of RE system utilization best practices (electricity and non-electricity)			x	x																
A2.5	Design and Initiation of RE system R&D program							x	x	x											
1.2.5	RE system equipment standards setting									x	x	x	x								
A.3	RE demonstration projects																				
A3.1	Techno-economic feasibility analyses of potential RE-based energy systems project				x	x	x	x													
A3.2	Identification and evaluation of RET application demonstration requirements				x	x	x	x													
A3.3	Removal of barriers to the successful implementation of RE demo projects									x	x	x	x								

No	COMPONENTS/ACTIVITIES	Year 1				Year 2				Year 3				Year 4				Year 5			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
A3.4	Establishment of baseline data for the RE demonstration sites				x	x	x														
A4.1	Design of RE demonstration projects					x	x	x	x	x	x	x	x								
A4.2	Implementation of RE demonstration projects																				
A4.3	M&E of RE demonstration projects																				
A4.4	Evaluation and dissemination of the results of the demonstration program			x	x	x	x	x	x	x	x	x	x								
A4.5	Design of sustainable follow-up program for RE development							x	x	x	x										
B	MARKET DEVELOPMENT																				
B1.1	Formulation of Plans for RE-based energy system projects					x	x	x	x												
B1.2	Promotion of bulk RE system equipment /component purchasing					x	x	x	x					x	x	x	x				
B1.3	Technical assistance on livelihood support					x	x	x	x	x	x	x	x								
B2.1	Assessment of local capabilities for RE services					x	x	x	x												
B2.2	Assessment of the viability of local manufacturing of RE system equipment and/or components					x	x	x	x												
B2.3	Introduction of a "One-Stop-Shop" service for RE market services							x	x	x	x										
B3.1	Development and promotion of ESCO-led RE system projects					x	x	x	x	x	x	x	x								
B3.2	Design and adoption of model fiscal incentives for RE investments									x	x	x									
B4.1	Training course on RE projects and RE-based livelihood / productivity projects financing					x				x				x				x			
B4.2	Establishment of Market for RESCO Services																				
C	INSTITUTIONAL STRENGTHENING																				
C1.1	Conduct of training in Integrated Energy Planning													x	x	x	x				
C2.1	Establishment of RE Policy Committees	x	x																		
C3.1	Strengthening of Energy Offices in PICs	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C3.2	Conduct of a detailed study of Energy Supply and Consumption in the PICs									x	x	x	x	x	x	x	x				
C3.3	Development of a RE planning model							x	x												
D	FINANCING SUPPORT																				
D1.1	RE business financing capacity building							x					x			x					

No	COMPONENTS/ACTIVITIES	Year 1				Year 2				Year 3				Year 4				Year 5			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
D1.2	Assistance for accessing local financing			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
D1.3	Establishment of RE financing facility in PICs																	x	x	x	x
D1.4	Design and implementation of smart RE financing schemes													x	x	x	x				
D2.1	Service provision to RE financing applicants					x	x	x	x	x	x										
D2.2	Evaluation of the RE financing assistance program				x	x	x	x													
D2.3	Financing Schemes review					x	x	x	x												
D2.4	Sustainable follow up program design													x	x	x	x	x	x	x	x
E	POLICY AND REGULATORY SUPPORT																				
E1.1	Formulation and implementation of national energy policy							x	x	x	x	x	x								
E1.2	Conduct of RE Policy Review					x	x	x	x												
E1.3	RE policy analyses					x	x	x	x												
E2.1	Study on RE-based livelihood and productivity projects support policy							x	x	x	x	x	x								
E2.2	Evaluation of the national energy policy implementation					x	x	x	x	x	x										
E3.1	RE electricity policy study			x	x	x	x														
E3.2	RE electricity pricing study			x	x	x	x														
E4.1	Legislation on RE system Equipment / Components Standards									x	x	x	x	x	x	x	x				
E5.1	Conduct of RE promotion workshops				x				x				x					x			x
F	INFORMATION AND AWARENESS ENHANCEMENT																				
F1.1	Establishment of a RE information centre				x	x	x	x	x												
F1.2	Establishment and Implementation of an integrated RE information exchange service			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
F1.3	RE advocacy and Promotion			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
F1.4	Information campaigns on RE technology applications			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
F1.5	RE Website development			x	x	x	x	x													
F2.1	Regional RE awards program				x				x				x					x			x
F3.1	Design and conduct of a RE technology education program					x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
F3.2	Design and implementation of RE training program					x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Annex G: Annual Targets and Monitoring Plan

A. Annual Targets

Strategy	Indicator	Annual Targets					
		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
I. DEVELOPMENT OBJECTIVE/GOAL							
Reduction of the growth rate of GHG emissions from fossil fuel use in the PICs through the widespread and cost effective use of RE resources and application of feasible RE technologies	Cumulative CO2 emissions reduced (ktons)	0	13.2	53.0	132.5	238.6	371.1
II. IMMEDIATE OBJECTIVES/OUTCOMES							
A. Improved knowledge about RE resources potential and increase the number of successful commercial RE applications on the ground	A1. No. of resource monitoring studies completed	0	2	4	6	8	10
	A2. No. of commercially sustainable RE projects	0	2	4	6	8	10
B. Expansion of the market for RET applications	B1. No. of RET company in each PIC	0	2	4	6	8	10
	B2. Total additional RE-based energy system capacity installed in PICs (MW)	0	5	15	30	40	50
	B3. Value of income generating opportunities in PICs gained from RE	0	1	2	3	4	At least US\$ 5 million
	B4. No. of additional people in PICs served with RE	0	5,000	10,000	14,000	16,000	At least 20,000
	B5. No of additional social services (schools, health centres, telecommunication, etc) in each PICs using RE	0	6	10	14	18	At least 20
C. Enhancement of institutional capacity to design and implement RE	C1. No. of RE project designed and implemented by local experts in each PIC	0	2	5	7	9	10

Strategy	Indicator	Annual Targets					
		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
	C2. No. of energy offices that have established national energy coordination committees, have clear mandates, strategies and action plans	0	2	4	6	8	10
D. Improvement of the availability of funding for existing and new RE projects	D1. Total value of new investments in RE	0	20	40	60	80	At least US\$100 million
	D2. No. of commercially viable RE projects in the region identified, studied and prepared for donors, financiers and investors	0	4	8	12	16	At least 20
	D3. Completed study on a Regional RE Fund			1			
E. Strengthened legal and regulatory structures in the energy and environmental sectors	E1. No. of PICs having relevant Act/provisions (Energy and Environment) in place that supports RE development and utilization and the formulations of RE regulations and policies	0	2	4	7	9	11
	E2. No. of National energy balances prepared	0	0	4	8	12	14
	E3. Updated regional synthesis of the energy sector GHG emission inventory						1
F. Increased awareness and knowledge about RE among key stakeholders	F1. Extent of energy sector professionals, politicians, investors, senior government officials and the general public that are aware of the benefits of RE and local success stories						Majority
	F2. No. of comprehensively documented RE projects and accessible via internet based information system						10

Strategy	Indicator	Annual Targets					
		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
	F3. Percentage approval rating for RE technologies and projects in PICs						75
	F4. No. of additional PIC nationals with a university degree on the technical aspects of RE	0	0	4	14	16	At least 20

B. Monitoring Plan

Key Impact Indicators	Target	Means of Verification	Sampling Frequency	Location
Cumulative CO2 emissions reduced	0.37 M tons by 2010 or 2 M tons by 2015	Monitoring and evaluation report on avoided GHG emissions with respect to baseline National communications and GHG inventories	Start, middle and end of the PIGGAREP; Energy Offices to monitor and report after PIGGARREP	PICs
No. of commercially sustainable RE projects	10 by 2010	Monitoring & Evaluation based on data from the project sites Project Reports Annual Energy Sector Reports	Same as above	PICs
Total additional RE-based energy system capacity installed in PICs (MW)	At least 100 MW of additional RE installed in PICs by 2015	Registry of companies, files from responsible ministry Power Utilities statistics Annual Energy Sector Reports	Same as above	PICs
Value of income generating opportunities in PICs gained from RE	5 million by 2010	Chamber of Commerce Reports Household income surveys	Same as above, except Trade Department or Ministry	PICs
Total value of new investments in RE-based energy systems	100 million by 2015	Trade and Investment Reports Bank Loan reports	Same as above	PICs

Annex H: CO2 Emissions Reduction Estimates

The total CO2 emissions reduction attributed to the PIGGAREP is comprised of direct CO2 emissions, direct post-project CO2 emissions, and indirect CO2 emissions.

Direct CO2 Emissions Reductions

The PIGGAREP will include the implementation of demonstration activities involving the installation of new RE-based energy system capacity in the PICs of 50 MW. The following are the important assumptions used in the estimation of the CO2 emissions reduction from the PIGGAREP:

1. CO2 emission factor: The RE-based energy systems that will be installed will directly displace diesel fuel oil (DFO) used in diesel power generation. In this regard, the CO2 emission factor is 0.909 ton/MWh.
2. Forecast baseline CO2 emission per year is based on a projected DFO growth rate of about 3.7% per year from 2005 to 2020. The projected annual CO2 emissions for the same period are based on a reduced DFO consumption, whose average growth rate is at 2.7% per year.
3. Demonstration activities in the PIGGAREP will involve the installation of 50 MW capacity of RE-based energy systems, with an overall average operating characteristics:
 - Operating hours = 18 per day; 360 days/year
 - Average availability factor = 0.45

An estimated cumulative total of about 371,090 tons CO₂ can be avoided from the 50 MW demonstration projects that will be implemented under PIGGAREP. Based on the estimated cumulative installed capacity each year during the project life, the annual CO2 emissions reduction is as follows:

Table 1: Cumulative CO2 Emissions Reduction during PIGGAREP Implementation Period

Year	Installed Capacity, MW (cumulative)	Annual CO2 Emissions Reduction, tons
2006	5	13253
2007	15	39,760
2008	30	79,519
2009	40	106,026
2010	50	132,532

Direct Post-Project CO2 Reductions

PIGGAREP will bring about the enabling environments that are expected to induce investments on new RE technology replications that will bring the total installed capacity of new RE-based energy systems in the PICs to about 100 MW by end year 2015.

By end 2015, the total CO2 emissions reduction from the total installed capacity of 100 MW (2006-2015) is about 1,060,258 tons. The additional cumulative installed capacity of 50 MW after the PIGGAREP accounts for about 397,597 tons CO₂ avoided during the period 2011-2015. The rest (i.e., 662,661 tons) is from the 50 MW that will be installed during the PIGGAREP implementation

period. Considering only the installed additional RE-based energy system capacity of 100 MW, the Direct Post-Project CO2 Emissions Reduction is 1,060,258 tons.

Table 2: Cumulative CO2 Emissions After PIGGAREP

Year	Installed Capacity, MW (cumulative)	Annual CO2 Emissions Reduction, tons
2011	60	159,039
2012	70	185,545
2013	80	212,052
2014	90	238,558
2015	100	265,064

Indirect CO2 Reductions

PIGGAREP will create the enabling environment that will facilitate the widespread utilization of RETs in the PICs. The primary targets of the project are the rural areas that are in need of energy services both for meeting household energy needs as well as for community-based income generation and livelihood support activities. Capacity development activities that will be conducted under the project are expected to influence the relevant stakeholder entities in the promotion, support, design and installation, financing, operation and maintenance of commercially viable and sustainable RE-based energy system projects.

The project will also involve interventions that will bring about the necessary institutional, regulatory and financial policies and mechanisms that would enhance the promotion of the applicable and feasible RE technology application, and encourage the target groups in taking on the technology.

Based on trend analysis of historical data of DFO consumption (power and other non-transport applications), the projected DFO consumption during the next 10 years after PIGGAREP (2011-2020) will bring about a cumulative CO2 emission of about 61,698.3 ktons. The operation of a realistic technical potential for new RE-based energy systems in the region will bring about a reduced CO2 emission level of 53,190.7 ktons. This translates to a cumulative CO2 reduction (2011-2020) of about 8,507.6 ktons. The following table shows the CO2 emissions from 2 cases, business-as-usual (DFO-based power generation) and alternative (RE-based energy systems).

Table 3: CO2 Emissions (ktons) (Business-as-Usual & Alternative)

Year	Business-as-Usual	Alternative	Cumulative CO2 Emissions Reduction
2011	4852.8	4,479.6	373.2
2012	5,107.4	4,648.1	832.4
2013	5376.3	4,822.9	1,385.8
2014	5659.4	5,004.3	2,040.9
2015	5,956.9	5,192.5	2,805.3
2016	6,68.6	5387.8	3,686.1
2017	6,594.6	5,590.5	4,690.2
2018	6,934.8	5,800.7	5,824.3

Year	Business-as-Usual	Alternative	Cumulative CO2 Emissions Reduction
2019	7,89.4	6,018.9	7,094.7
2020	7,58.2	6,245.3	8,507.6

The GEF influence in achieving this additional CO2 emission reduction during the influence period, which in this case is 10 years after PIGGAREP (i.e., 2011-2020), is considered quite high, relative to that during the project period (i.e., 2005-2010). In that regard, most of the indirect CO2 reduction can be attributed partly to the interventions that will be carried out during the PIGGAREP such as the establishments and enforcement of RE policies and financing mechanisms, RE market enhancement, and the successful demonstration programs. In this case, the GEF Causality Factor (CF) can be taken as Level 3 (“substantial but modest”), i.e., 60%. In this regard, 60% of the estimated additional 8,507.6 ktons of CO2 emissions reduction can be considered as the PIGGAREP’s Indirect CO2 reduction.

$$\text{Indirect CO}_2 = 8,507.6 * 0.6 = 5,104.5 \text{ ktons (CF = 0.6)}$$

Total CO₂ Reduction

Particulars	Quantity, tons	Remarks
Direct CO ₂	371,090	From 50 MW demonstration projects during PIGGAREP
Direct Post-Project CO ₂	1,060,258	From replication projects of about 50 MW capacity (during 5 years after PIGGAREP)
Indirect CO ₂	5,104,500	GEF Causality Factor = 0.6

Total CO₂ reduction = Direct CO₂ + Direct post-project CO₂ + [Indirect CO₂ * GEF Causality Factor]

$$\text{Total CO}_2 \text{ Reduction} = 371.1 + 1,060.3 + 5,104.5 = 6,535.9 \text{ ktons}$$

By 2015, PIGGAREP would have influenced some of the PICs, and in this regard the GEF Causality Factor can be taken as Level 2 (“modest and substantial”), i.e., 0.40. The indirect CO2 emissions (based on cumulative amount by 2015) would be about 1,122.1 ktons. Total CO2 emissions reduction would be 2,553.5 ktons. However, considering some of the inaccuracies in the historical data, and to be conservative, PIGGAREP has targeted a rounded figure of 2,000 ktons as CO2 emissions reduction by 2015.

ANNEX I
INDICATIVE IN-COUNTRY PROJECT ACTIVITIES

The following summarizes some of the identified indicative activities that will be carried out by each PIC based on the findings and recommendations of the National RE Assessment reports. These will be confirmed and finalized during the project inception phase.

Activity	Description
COOK ISLANDS	
Priority RE resources ⁴	<ul style="list-style-type: none"> ▪ Wind, biodiesel and solar (PV)
Priority RET Applications	<ul style="list-style-type: none"> ▪ Grid-connected RETs
Demonstration RE installations	<ul style="list-style-type: none"> ▪ Mangaia Wind Power Project ▪ Pukapuka Solar PV Project
Technical Capacity Building and Technology Support	<ul style="list-style-type: none"> ▪ Wind (and solar)⁵ resources assessment on Aitutaki, Atiu, and Pukapuka and Manihiki islands. Production of wind and solar maps / atlas ▪ Biofuel resources assessment study ▪ Technical Assistance on the design and installations of SWH and PV systems in tourist premises ▪ Socio-economic and technical evaluation of the Mangaia Wind and Pukapuka PV projects (baseline data collection) ▪ Setting equipment standards for both solar PV, SWH and wind power and biodiesel equipments
Market Development	<ul style="list-style-type: none"> ▪ Evaluate viability of the local manufacture of solar water heaters ▪ Evaluate the viability of copra as livelihood support for outer islands development, income generation and as a RE source ▪ Assess the practicality and viability of setting up RESCOs ▪ Assess and identify the desired RET deployment that will be able to commercially compete with the diesel power generation on Mauke, Mitiaro and Penrhyn islands.
Institutional Strengthening	<ul style="list-style-type: none"> ▪ Degree level training on RE engineering for one Cook Is national ▪ Technical Support to energy office in terms of staff levels and sufficient resources for the effective management of RE projects ▪ Technical assistance to establish national RE coordination mechanisms (committees and country teams) ▪ Energy supply, consumption and energy prices study for the formulation of a national energy plan and policy
Financial Support	<ul style="list-style-type: none"> ▪ RE business training and financing capacity building for local banks ▪ Review of current financing schemes involving RE and design and implement smart RE financing schemes ▪ Support the Energy Office to be able to assist the general public, the private sector and businesses that want to seek financing for solar, wind and biodiesel projects
Policy and Regulatory Support	<ul style="list-style-type: none"> ▪ Identify existing Acts, government policies and practices that are biased against RE ▪ Review existing policies and Acts and adopt / enact new policies and acts (as appropriate) to ensure fair competition between RETs and conventional technologies
Information and awareness enhancement	<ul style="list-style-type: none"> ▪ Establishment and funding of a RE information centre in the Energy Office ▪ RE advocacy programmes for the general public and schools (through trade fairs / shows, the radio, newspaper and TV)

⁴ Priority RETs are listed in descending order of priority based on available resources for GHG reduction and are not based on economic feasibility.

Activity	Description
	<ul style="list-style-type: none"> ▪ National RE Award Programme ▪ RE website development ▪ Design and Implementation of various RE training programmes (study tours, RE project design and management, energy pricing, etc).
FIJI	
Priority RE resources	<ul style="list-style-type: none"> ▪ Hydro, Geothermal, Ethanol and Wind
Priority RET Applications	<ul style="list-style-type: none"> ▪ On-Grid and Off-Grid RETs
Demonstration RE installations	<ul style="list-style-type: none"> ▪ Bukuya mini hydro project ▪ Nabouwalu solar/wind and diesel hybrid system
Technical Capacity Building and Technology Support	<ul style="list-style-type: none"> ▪ Hydro resource assessment at Upper Singatoka/Ba and Navua Areas ▪ Wind (and solar) resources assessment at Korotongo, Gamu and Waibogi at 20-40 mAGL ▪ Technical Assistance to the FEA and PWD on the design and installations of wind and hydro systems ▪ Socio-economic and technical evaluation of the Bukuya hydro project and the Nabouwalu hybrid system (baseline data collection) ▪ Setting equipment standards for both solar PV, SWH and wind power and hydro equipments
Market Development	<ul style="list-style-type: none"> ▪ Provide TA to the local manufacture of SWH and design and implement a marketing promotion strategy in other PICs ▪ Evaluate viability of the local manufacture of solar PV cells, batteries and regulators ▪ Evaluate the viability of blended ethanol as a livelihood support for sugar cane farmers and as a transport fuel ▪ Promote a demonstration project to showcase the business angle of RE delivery through a dissemination of SHS to rural areas through partnerships with govt and the private sector (RESCOs) focusing ▪ Establish a 'RE One-Stop-Shop' service at the energy office ▪ Promote bulk purchasing of RE equipment and components ▪ Assess the practicality and viability of setting up RESCOs ▪ Assess and identify the desired RET deployment that will be able to commercially compete with the diesel power generation in one rural settlement in Vanua Levu
Institutional Strengthening	<ul style="list-style-type: none"> ▪ Technical assistance to establish national RE coordination mechanisms (committees and country teams) ▪ Energy supply, consumption and energy prices study for the formulation of a national energy plan and policy
Financial Support	<ul style="list-style-type: none"> ▪ RE business training and financing capacity building for local banks ▪ Review of current financing schemes involving RE and design and implement smart RE financing schemes ▪ Assess the viability of a financing facility for rural electrification and how it can be established ▪ Support the Energy Office to be able to assist the general public, the private sector and businesses that want to seek financing for solar, wind and biodiesel projects
Policy and Regulatory Support	<ul style="list-style-type: none"> ▪ Identify existing Acts, government policies and practices that are biased against RE ▪ Review existing policies and Acts and adopt / enact new policies and acts (as appropriate) to ensure fair competition between RETs and conventional technologies
Information and awareness enhancement	<ul style="list-style-type: none"> ▪ Establishment and funding of a RE information centre in the Energy Office ▪ RE advocacy programmes for the general public and schools (through trade fairs / shows, the radio, newspapers and TV) ▪ National RE Award Programme ▪ RE website development ▪ Design and Implementation of various RE training programmes (study tours, RE

Activity	Description
	project design and management, energy pricing, RE power purchase contracting, etc).
KIRIBATI	
Priority RE resources	<ul style="list-style-type: none"> ▪ Biodiesel and solar (PV)
Priority RET Applications	<ul style="list-style-type: none"> ▪ On-Grid and Off-Grid RETs
Demonstration RE installations	<ul style="list-style-type: none"> ▪ The European Union's outer islands solar electrification project
Technical Capacity Building and Technology Support	<ul style="list-style-type: none"> ▪ Biofuel resources assessment study ▪ Setting equipment standards for solar PV systems
Market Development	<ul style="list-style-type: none"> ▪ Technical assistance to the local manufacture and marketing of SEC's regulators ▪ Evaluate the viability of copra as livelihood support for outer islands development, income generation and as a RE source ▪ Promote a demonstration project with SEC to showcase the business angle of RE delivery through the development of coconut oil as a biofuel substitute for diesel in power generation and transport
Institutional Strengthening	<ul style="list-style-type: none"> ▪ Degree level training on RE engineering for a staff member of the SEC ▪ Technical Support to the SEC in terms of staff levels and sufficient resources for the effective management of its RE projects ▪ Technical assistance to establish national RE coordination mechanisms (committees and country teams) ▪ Energy supply, consumption and energy prices study for the formulation of a national energy plan and policy
Financial Support	<ul style="list-style-type: none"> ▪ RE business training and financing capacity building for local banks ▪ Review of current financing schemes involving RE and design and implement smart RE financing schemes ▪ Support the Energy Office to be able to assist the general public, the private sector and businesses that want to seek financing for solar PV projects
Policy and Regulatory Support	<ul style="list-style-type: none"> ▪ Identify existing Acts, government policies and practices that are biased against RE ▪ Review existing policies and Acts and adopt / enact new policies and acts (as appropriate) to ensure fair competition between RETs and conventional technologies
Information and awareness enhancement	<ul style="list-style-type: none"> ▪ Establishment and funding of a RE information centre in the Energy Office ▪ RE advocacy programmes for the general public and schools (through trade fairs / shows, the radio, newspaper and TV) ▪ National RE Award Programme ▪ RE website development ▪ Design and Implementation of various RE training programmes (study tours, RE project design and management, energy pricing, etc).
NAURU	
Priority RE resources	<ul style="list-style-type: none"> ▪ Solar (PV)
Priority RET Applications	<ul style="list-style-type: none"> ▪ Grid-connected RETs
Demonstration RE installations	<ul style="list-style-type: none"> ▪ The European Union's RE assistance programme to the 5 new ACPs in the PICs
Technical Capacity Building and Technology Support	<ul style="list-style-type: none"> ▪ Setting equipment standards for solar PV and EE systems ▪ Study the feasibility of, and provide training on, a demonstration PV-grid connected project
Market Development	<ul style="list-style-type: none"> ▪ Identify and conduct detailed feasibility studies of RE and EE projects
Institutional Strengthening	<ul style="list-style-type: none"> ▪ Degree level training on Rational Use of energy resources for one Nauru national ▪ Technical Support to the Nauru Phosphate Corporation in terms of staff levels and sufficient resources for the effective management of RE and EE projects ▪ Technical assistance to establish national RE and EE coordination mechanisms

Activity	Description
	(committees and country teams) <ul style="list-style-type: none"> ▪ Energy supply, consumption and energy prices study for the formulation of a national energy plan and policy
Financial Support	<ul style="list-style-type: none"> ▪ Review of current financing schemes involving RE/EE and design and implement smart RE/EE financing schemes ▪ Support the Energy Office to be able to assist the general public, the private sector and businesses that want to seek financing for RE/EE projects
Policy and Regulatory Support	<ul style="list-style-type: none"> ▪ Identify existing Acts, government policies and practices that are biased against RE/EE, particularly the policies relating to the electricity tariff ▪ Review existing policies and Acts and adopt / enact new policies and acts (as appropriate) to promote RE/EE research
Information and awareness enhancement	<ul style="list-style-type: none"> ▪ Establishment and funding of a RE/EE information centre in the Energy Office ▪ RE and EE advocacy programmes for the general public and schools (through trade fairs / shows, the radio, newspaper and TV) ▪ National RE/EE Award Programme ▪ RE/EE website development ▪ Design and Implementation of various RE/EE training programmes (study tours, project design and management, energy pricing, etc).
NIUE	
Priority RETs	<ul style="list-style-type: none"> ▪ Solar and Wind
Priority RET Applications	<ul style="list-style-type: none"> ▪ Grid-connected RETs
Demonstration RE installations	<ul style="list-style-type: none"> ▪ The European Union's RE assistance programme to the 5 new ACPs in the PICs (wind power) ▪ The Makefu water pumping project
Technical Capacity Building and Technology Support	<ul style="list-style-type: none"> ▪ Wind (and solar) resources assessment on Liku and Makefu. Production of wind and solar maps / atlas ▪ Setting equipment standards for solar water heaters and wind power components ▪ Study the feasibility of, and provide training on, a demonstration PV-grid connected project
Market Development	<ul style="list-style-type: none"> ▪ Identify and conduct detailed feasibility studies of grid connected wind power systems ▪ Design and adopt model fiscal incentives for purchasing solar water heaters
Institutional Strengthening	<ul style="list-style-type: none"> ▪ Degree level training on RE engineering for a staff member of the Niue Power Corporation ▪ Technical Support to the NPC in terms of staff levels and sufficient resources for the effective management of RE projects ▪ Technical assistance to establish national RE coordination mechanisms (committees and country teams) ▪ Energy supply, consumption and energy prices study for the formulation of a national energy plan and policy
Financial Support	<ul style="list-style-type: none"> ▪ Review of current financing schemes involving RE and design and implement smart RE financing schemes focusing on SWH and wind power development ▪ Support the Energy Office to be able to assist the general public, the private sector and businesses that want to seek financing for EE projects
Policy and Regulatory Support	<ul style="list-style-type: none"> ▪ Identify existing Acts, government policies and practices that are biased against RE ▪ Review existing policies and Acts and adopt / enact new policies and acts (as appropriate) to promote RE
Information and awareness enhancement	<ul style="list-style-type: none"> ▪ RE advocacy programmes for the general public and schools (through trade fairs / shows, the radio, newspaper and TV) ▪ National RE Award Programme ▪ RE website development ▪ Design and Implementation of various RE training programmes (study tours, project

Activity	Description
	design and management, energy pricing, etc).
PAPUA NEW GUINEA	
Priority RE resources	<ul style="list-style-type: none"> Hydro, Geothermal, Ethanol and Biodiesel
Priority RET Applications	<ul style="list-style-type: none"> On-Grid and Off-Grid RETs
Demonstration RE installations	<ul style="list-style-type: none"> The Chinese-funded wind power project The Luwini (Oro) hydropower project
Technical Capacity Building and Technology Support	<ul style="list-style-type: none"> Wind (and solar) resources assessment at Milne Bay Technical Assistance to the FEA and PWD on the design and installations of wind and hydro systems Socio-economic and technical evaluation of the proposed Bogo/Kawa Micro Hydro Power Project, Kerowagi District, Simbu Province Setting equipment standards for both solar PV, SWH and wind power and hydro equipments
Market Development	<ul style="list-style-type: none"> Provide TA to the local manufacture of SWH and design and implement a marketing promotion strategy in other PICs Evaluate viability of the local manufacture of solar water heaters Evaluate the viability of blended ethanol as a livelihood support for sugar cane farmers and as a transport fuel Establish a 'RE One-Stop-Shop' service at the energy office Promote bulk purchasing of RE equipment and components Assess the practicality and viability of setting up RESCOs
Institutional Strengthening	<ul style="list-style-type: none"> Technical assistance to establish national RE coordination mechanisms (committees and country teams) Technical Assistance to the RE development works of the University of Technology Energy supply, consumption and energy prices study for the formulation of a national energy plan and policy
Financial Support	<ul style="list-style-type: none"> RE business training and financing capacity building for local banks Review of current financing schemes like the PNG Sustainable Development Fund and design and implement smart RE financing schemes Assess the viability of other financing facilities for rural electrification and how it can be established Support the Energy Office to be able to assist the general public, the private sector and businesses that want to seek financing for RE development
Policy and Regulatory Support	<ul style="list-style-type: none"> Identify existing Acts, government policies and practices that are biased against RE Review existing policies and Acts and adopt / enact new policies and acts (as appropriate) to ensure fair competition between RETs and conventional technologies
Information and awareness enhancement	<ul style="list-style-type: none"> Establishment and funding of a RE information centre in the Energy Office RE advocacy programmes for the general public and schools (through trade fairs / shows, the radio, newspapers and TV) National RE Award Programme RE website development Design and Implementation of various RE training programmes (study tours, RE project design and management, energy pricing, RE power purchase contracting, etc).
SAMOA	
Priority RE resources	<ul style="list-style-type: none"> Hydro, Biodiesel and Geothermal
Priority RET Applications	<ul style="list-style-type: none"> Grid-connected RETs
Demonstration RE installations	<ul style="list-style-type: none"> The copra biofuel project The Apolima Hydro Power project
Technical Capacity Building and	<ul style="list-style-type: none"> Review the findings from earlier geothermal assessment activities Evaluate the viability of copra as livelihood support for rural villages, income

Activity	Description
Technology Support	<ul style="list-style-type: none"> generation and as a RE source ▪ Technical Assistance to the EPC to further advance it work on biofuel ▪ Socio-economic and technical evaluation of the proposed REEP demonstration project under the REEP ▪ Socio-economic and technical evaluation of the Tafa'ingata waste to energy project
Market Development	<ul style="list-style-type: none"> ▪ Assess the practicality and viability of setting up RESCOs
Institutional Strengthening	<ul style="list-style-type: none"> ▪ Degree level training on RE engineering for a staff member of the EPC ▪ Technical assistance to establish national RE coordination mechanisms (committees and country teams) ▪ Energy supply, consumption and energy prices study for the formulation of a national energy plan and policy
Financial Support	<ul style="list-style-type: none"> ▪ RE business training and financing capacity building for local banks ▪ Review of current financing schemes like the Venture Capital Fund and design and implement smart RE financing schemes targeting solar water heaters ▪ Assess the viability of other financing facilities for rural electrification and how it can be established ▪ Support the Energy Office to be able to assist the general public, the private sector and businesses that want to seek financing for RE development
Policy and Regulatory Support	<ul style="list-style-type: none"> ▪ Identify existing Acts, government policies and practices that are biased against RE ▪ Review existing policies and Acts and adopt / enact new policies and acts (as appropriate) to ensure fair competition between RETs and conventional technologies
Information and awareness enhancement	<ul style="list-style-type: none"> ▪ Establishment and funding of a RE information centre in the Energy Office ▪ RE advocacy programmes for the general public and schools (through trade fairs / shows, the radio, newspapers and TV) ▪ National RE Award Programme ▪ RE website development ▪ Design and Implementation of various RE training programmes (study tours, RE project design and management, energy pricing, etc).
SOLOMON ISLANDS	
Priority RE resources	<ul style="list-style-type: none"> ▪ Biodiesel, Hydro and Solar
Priority RET Applications	<ul style="list-style-type: none"> ▪ On-Grid and Off-Grid RETs
Demonstration RE installations	<ul style="list-style-type: none"> ▪ Malaita Hydroscheme on the Malu'u River ▪ Willies Electrical & Solar Power School
Technical Capacity Building and Technology Support	<ul style="list-style-type: none"> ▪ Wind (and solar) resources assessment at Milne Bay ▪ Technical Assistance to the SIEA on the design and installations of mini hydro projects ▪ Socio-economic and technical evaluation of the APACE and SIVVEC micro-hydro and solar PV projects proposed Bogu/Kawa Micro Hydro Power Project, Kerowagi District, Simbu Province ▪ Evaluate the viability of copra as livelihood support for rural villages, income generation and as a RE source ▪ Technical Assistance to the EPC to further advance it work on biofuel
Market Development	<ul style="list-style-type: none"> ▪ Conduct feasibility studies of geothermal at West Guadalcanal, Paraiso, Simbo Is and Savo Is. ▪ Evaluate the viability of copra and palm oil as a livelihood support for farmers and as a transport fuel ▪ Review the SIEA's biofuel demonstration activities ▪ Establish a 'RE One-Stop-Shop' service at the energy office ▪ Assess the practicality and viability of setting up RESCOs
Institutional Strengthening	<ul style="list-style-type: none"> ▪ Degree level training on RE engineering for a staff member of the SIEA ▪ Technical Support to energy office in terms of staff levels and sufficient resources for the effective management of RE projects

Activity	Description
	<ul style="list-style-type: none"> ▪ Technical assistance to establish national RE coordination mechanisms (committees and country teams) ▪ Technical Assistance to the RE development works of the Willies Electrical & Solar Power School ▪ Energy supply, consumption and energy prices study for the formulation of a national energy plan and policy
Financial Support	<ul style="list-style-type: none"> ▪ RE business training and financing capacity building for local banks ▪ Review of current financing schemes and design and implement smart RE financing schemes ▪ Assess the viability of other financing facilities for rural electrification and how it can be established ▪ Support the Energy Office to be able to assist the general public, the private sector and businesses that want to seek financing for RE development
Policy and Regulatory Support	<ul style="list-style-type: none"> ▪ Identify existing Acts, government policies and practices that are biased against RE ▪ Review existing policies and Acts and adopt / enact new policies and acts (as appropriate) to ensure fair competition between RETs and conventional technologies
Information and awareness enhancement	<ul style="list-style-type: none"> ▪ Establishment and funding of a RE information centre in the Energy Office ▪ RE advocacy programmes for the general public and schools (through trade fairs / shows, the radio, newspapers and TV) ▪ National RE Award Programme ▪ RE website development ▪ Design and Implementation of various RE training programmes (study tours, RE project design and management, energy pricing, RE power purchase contracting, etc).
TONGA	
Priority RE resources	<ul style="list-style-type: none"> ▪ Biodiesel, Wind and Solar
Priority RET Applications	<ul style="list-style-type: none"> ▪ On-Grid and Off-Grid RETs
Demonstration RE installations	<ul style="list-style-type: none"> ▪ Ha'apai and Niufo'ou PV Projects ▪ Shoreline's alternative energy development
Technical Capacity Building and Technology Support	<ul style="list-style-type: none"> ▪ Extend the Shoreline's wind resources assessment activities in Vava'u and 'Eua ▪ Technical Assistance to the Ha'apai and Niufo'ou Solar PV Projects ▪ Evaluate the viability of copra as livelihood support for rural villages/islands, income generation and as a RE source
Market Development	<ul style="list-style-type: none"> ▪ Conduct feasibility studies of a PV-grid connected project at Ha'apai and 'Eua ▪ Identify the required extent of RE deployment at Niuatoputapu that will make RE cost competitive against diesel electrification ▪ Design and implement a demonstration project showcasing the business angle of the local manufacture, proper installation and maintenance of SWH ▪ Establish a 'RE One-Stop-Shop' service at the energy office ▪ Assess the practicality and viability of setting up RESCOs
Institutional Strengthening	<ul style="list-style-type: none"> ▪ Technical Support to energy office in terms of staff levels and sufficient resources for the effective management of RE projects ▪ Degree level training on RE engineering for a staff member of the EPU ▪ Technical assistance to establish national RE coordination mechanisms (committees and country teams) ▪ Technical Assistance to the TEPB's power sector regulatory roles ▪ Energy supply, consumption and energy prices study for the formulation of a national energy plan and policy
Financial Support	<ul style="list-style-type: none"> ▪ RE business training and financing capacity building for local banks ▪ Review of current financing schemes and design and implement smart RE financing schemes ▪ Assess the viability of other financing facilities for rural electrification and how it can be established

Activity	Description
	<ul style="list-style-type: none"> Support the Energy Office to be able to assist the general public, the private sector and businesses that want to seek financing for RE development
Policy and Regulatory Support	<ul style="list-style-type: none"> Identify existing Acts, government policies and practices that are biased against RE Review existing policies and Acts and adopt / enact new policies and acts (as appropriate) to ensure fair competition between RETs and conventional technologies
Information and awareness enhancement	<ul style="list-style-type: none"> Establishment and funding of a RE information centre in the Energy Office RE advocacy programmes for the general public and schools (through trade fairs / shows, the radio, newspapers and TV) National RE Award Programme RE website development Design and Implementation of various RE training programmes (study tours, RE project design and management, energy pricing, RE power purchase contracting, etc).
TUVALU	
Priority RE resources	<ul style="list-style-type: none"> Biodiesel, Solar
Priority RET Applications	<ul style="list-style-type: none"> On-Grid and Off-Grid RETs
Demonstration RE installations	<ul style="list-style-type: none"> Restructuring the Tuvalu Solar Electricity Cooperative Niulakita PV project
Technical Capacity Building and Technology Support	<ul style="list-style-type: none"> Evaluate the viability of copra as livelihood support for rural villages/islands, income generation and as a RE source Conduct a technical evaluation of the TSEC PV installations Assess the power generation efficiency of TEC's generation centres Study feasibilities of grid connected PV projects on Nukulaelae, Niutao and Vaitupu diesel grids
Market Development	<ul style="list-style-type: none"> Assess the practicality and viability of setting up RESCOs for both RE and EE
Institutional Strengthening	<ul style="list-style-type: none"> Degree level training on the Rational Use of Energy for a staff member of the TEC Technical assistance to establish national RE coordination mechanisms (committees and country teams) Technical Assistance to the EPU's power sector regulatory roles Energy supply, consumption and energy prices study for the formulation of a national energy plan and policy
Financial Support	<ul style="list-style-type: none"> RE business training and financing capacity building for local banks Review of current financing schemes and design and implement smart RE financing schemes Assess the viability of other financing facilities for rural electrification and how it can be established Support the Energy Office to be able to assist the general public, the private sector and businesses that want to seek financing for RE development
Policy and Regulatory Support	<ul style="list-style-type: none"> Identify existing Acts, government policies and practices that are biased against RE Review existing policies and Acts and adopt / enact new policies and acts (as appropriate) to ensure fair competition between RETs and conventional technologies
Information and awareness enhancement	<ul style="list-style-type: none"> Establishment and funding of a RE information centre in the Energy Office RE advocacy programmes for the general public and schools (through trade fairs / shows, the radio, newspapers and TV) National RE/EE Award Programme RE/EE website development Design and Implementation of various RE/EE training programmes (study tours, RE/EE project design and management, energy pricing, etc).
VANUATU	
Priority RE resources	<ul style="list-style-type: none"> Biodiesel, Geothermal, Hydro and Solar
Priority RET	<ul style="list-style-type: none"> On-Grid and Off-Grid RETs

Activity	Description
Applications	
Demonstration RE installations	<ul style="list-style-type: none"> ▪ Island Fuel’s bio-fuel development ▪ Torba Province Community Solar Electrification Project
Technical Capacity Building and Technology Support	<ul style="list-style-type: none"> ▪ Evaluate the viability of copra as livelihood support for rural villages/islands, income generation and as a RE source ▪ Review past geothermal studies in Vanuatu
Market Development	<ul style="list-style-type: none"> ▪ Assess the practicality and viability of setting up RESCOs ▪ Advance the preliminary feasibility studies in Maewo, Talise and Nasawa
Institutional Strengthening	<ul style="list-style-type: none"> ▪ Degree level training on RE engineering for a staff member of the Energy Unit ▪ Technical Support to energy office in terms of staff levels and sufficient resources for the effective management of RE projects ▪ Technical assistance to establish national RE coordination mechanisms (committees and country teams) ▪ Technical Assistance to the EPU’s power sector regulatory roles and negotiations with UNELCO ▪ Energy supply, consumption and energy prices study for the formulation of a national energy plan and policy
Financial Support	<ul style="list-style-type: none"> ▪ RE business training and financing capacity building for local banks ▪ Review of current financing schemes and design and implement smart RE financing schemes ▪ Assess the viability of other financing facilities for rural electrification and how it can be established ▪ Support the Energy Office to be able to assist the general public, the private sector and businesses that want to seek financing for RE development
Policy and Regulatory Support	<ul style="list-style-type: none"> ▪ Identify existing Acts, government policies and practices that are biased against RE ▪ Review existing policies and Acts and adopt / enact new policies and acts (as appropriate) to ensure fair competition between RETs and conventional technologies
Information and awareness enhancement	<ul style="list-style-type: none"> ▪ Establishment and funding of a RE information centre in the Energy Office ▪ RE advocacy programmes for the general public and schools (through trade fairs / shows, the radio, newspapers and TV) ▪ National RE Award Programme ▪ RE website development ▪ Design and Implementation of various RE training programmes (study tours, RE project design and management, energy pricing, RE power purchase contracting, etc).

Annex J
Energy Sector Profile of Pacific Island Countries

A. Electricity Supply

Country	Population	% With electricity access	% RE in power generation mix
Cook Islands	19,500	90	0
Fiji	77,700	60	51
FSM	106,500	75	4
Kiribati	78,300	40	0
Marshall Islands	57,500	90	0
Nauru	10,400	100	0
Niue	2,100	99	0
Palau	15,000	60	0
PNG	4,200,000	10	60
Samoa	163,000	60	51
Solomon Islands	380,000	10	13
Tonga	98,500	85	0
Tuvalu	9,500	30	0
Vanuatu	169,000	25	0

B. PIC Energy Offices

Country	Staff Complement ¹	Legal Authority ²	Policy Role or Implementation ³	Oversee Power Utilities ⁴	Oil Pricing or Policy Role ⁵
Cook Islands	3	No	Both	Indirect	No
Fiji*	18	No	Both	Indirect	No
FSM	2	No	Both	No	No
Kiribati	2	No	Both	Indirect	Indirect
Marshall Islands*	2	No	Both	N/A	No
Nauru	1	No	Both	N/A	N/A
Niue	1***	No	Both	Yes	N/A
PNG	N/A	No	Both	Indirect	No
Palau	1	No	Both	No	No
Solomon Islands	1	No	Both	Indirect	No
Samoa	1	No	Both	Indirect	Yes
Tonga*	4**	No	Both	N/A	No
Tuvalu*	1**	No	Both	Indirect	No
Vanuatu	3	No	Both	No	No

* Indicates that some information was received from the energy office in November 2004.

** Excludes several RET technicians

*** For Niue, the electricity utility handles energy matters overall.

1. Approximate full time staff in the energy office, energy department, energy unit, etc of the government. This excludes any government-owned energy company (e.g. Kiribati Solar Energy Company or Kiribati national Oil Company).
2. Energy office/ministry established under legislation approved by Parliament (and thus providing statutory responsibilities and powers)
3. Energy office/ministry deal only with policy & planning or also have responsibility for project implementation
4. Energy office/ministry have a seat on the board of the power utility or RE utility or petroleum company
'Indirect' means that the Permanent Secretary or other senior official of same ministry is a Director.
5. Energy office/ministry have a legal role regarding petroleum fuel pricing, product quality, safety storage, etc.

C. Status of National Energy Policies and Plans of PICs

Country	National Energy Policies	Energy Plans or Energy Components of National Development Plans
Cook Islands	The govt. prepared a draft energy policy in 2001, which was reviewed internally & externally and substantially revised over the next year. Cabinet adopted a final version in April 2003.	No action plan for energy has been developed. A National Strategic Plan was being developed in mid 2003 with some limited energy coverage
Fiji *	Corporate Plan for the Department of Energy 2002-2006 provides guidance for DoE's work. The Strategic Development Plan (SDP) 2003-2005 requires "a comprehensive national energy policy to address RE, efficiency and affordability, and environmental sustainability" but not yet written.	An energy chapter of a proposed national plan was prepared in early 2000 but never finalised due to a coup in May 2000. SDP 2003-2005 has limited energy coverage
FSM	A draft national energy policy was prepared in August 1999 and reviewed in mid 2003. This work is still ongoing.	The National Planning Framework for 1999-2002 was being updated during 2003. The current status and extent of energy sector content are not known.
Kiribati	A draft energy policy prepared about 1996 with the assistance of the Forum Secretariat was not finalised.	National Development Strategy 2000-2003 was being updated in 2003. The current status and extent of energy content are not known.
Marshall Islands*	Cabinet endorsed a national energy policy statement in April 2003.	A set of strategies to implement the policy was discussed in April 2003. Additional public consultations are planned. There is a Strategic Development Plan Framework 2003-2018 (Vision 2018) with some energy content.
Nauru	There is no national energy policy.	A draft Nauru Development Plan (2002-2006) may not have been finalised. The extent of energy content is not known.
Niue	The government adopted an energy policy in 1995 but is currently under review.	There is a Niue Integrated Strategic Plan (1999-2003). The energy content is not known.

Country	National Energy Policies	Energy Plans or Energy Components of National Development Plans
PNG	There is a draft energy policy (date unknown) currently being revised.	There is no current national plan
Palau	Status not known	The National Development Strategy of 1996-2001 apparently remains in force. There is apparently some energy content.
Solomon Islands	A draft energy policy was prepared but not finalised. The Japanese govt. has helped develop an energy master plan (2001); its status is not known.	The SI are emerging from several years of conflict and there is little planning at present but considerable donor assistance
Samoa	A draft national policy was prepared in 2003, reviewed at a stakeholders meeting and is - currently being finalised.	The Strategy for the Development of Samoa: 2002-2004 has some limited coverage of energy, mainly power sector corporatisation plans.
Tonga*	A draft policy based on the PIEPP framework was prepared in 2002 but requires further development	Strategic Development Plan 7 is valid until July 2004. Energy content is not known.
Tuvalu*	The Tuvalu National Energy Policy Statement of 1995 was approved by Cabinet but never really used. Preliminary work has begun on a new policy.	The National Development Strategy 1995 – 1998 is the most recent national plan. There is limited energy coverage but it is well out of date..
Vanuatu	An energy policy was prepared about 1996 with assistance of the Forum Secretariat and apparently 'adopted'. It is effectively defunct.	A National Plan being is reportedly being drafted in late 2003. The status is unknown.

*Indicates that some information was received from the government by 13 November 2004.

D. Energy Data Sources

Country	Status of Database (data for 1990-99)	Availability of data
Cook Islands	Completed except for RE resources	Data for 1990-1999 is available
Fiji	Energy Statistics Yearbook for 2002 completed in draft form	Data is available.
FSM	Data collection slowly on-going. ESCAP advised Dept. of Energy on energy data needs in late 2001	FSM is difficult as there are four largely autonomous states with varying degrees of data
Kiribati	Completed for the period 1990-99	Data is available
FSM	Data collection is slow but proceeding	Limited data is available
Marshall Islands	Data collection is slow but proceeding	Some data is available
Nauru	Data collection is slow but proceeding	Limited data is available
Niue	Data collection is slow but proceeding	Limited data is available
PNG	Data collection is slow but proceeding	Limited data is available
Palau	Data collection is slow but proceeding	Limited data is available
Solomon	Data collection is slow but proceeding	Difficult due to considerable loss of

Country	Status of Database (data for 1990-99)	Availability of data
Islands		data & lack of collection during recent civil conflicts, now ended
Samoa	Data collection is slow but proceeding	Limited data is available
Tonga	Completed for the period 1990-99	Some data is available
Tuvalu	Data collection is slow but proceeding	Limited data is available
Vanuatu	Data collection is slow but proceeding	Limited data is available

Note: Where data are available on traditional or RE use, biomass fuel use (which is extensive) is typically estimated from household energy surveys, which are a decade or more old. Data on biomass for electricity production (wood; sugar cane bagasse, etc.) are much more accurate.

D. Rural Electrification Policies

Country	Status (as of August 2003)
Cook Islands	In effect, policies and pricing differ island-by-island. The government is currently considering RE policy changes.
Fiji	Current policy dates from 1993 and has not been as effective as hoped in substantially increasing RE to off-grid & island communities. Policy is currently under review. An ADB RE study underway in early November 2003 also includes the review of RE policy. Draft legislation on Renewable Energy Service Companies (RESCOs) was completed August 2003 as part of a UNDP/GEF project but is unlikely to be enacted soon.
FSM	A review of the solar electrification policy has been planned since 2002. An ADB 'Omnibus Infrastructure project' is looking to some extent at RE policy & investment needs but apparently not policies.
Kiribati	Preliminary assistance has been provided to the Solar Energy Company (SEC) but there is a need for policy consistency between diesel-based and renewable systems.
Marshall Islands	Preliminary assistance has been provided as part of the development of national energy policy. As in many countries, a consistent RE policy framework is lacking.
Nauru	The country is a single island. There is no RE policy and possibly no real need for one except for planned RE initiatives, particularly implementation guidelines
Niue	Same as Nauru
PNG	The World Bank carried out an RE policy review in August 2003 as part of a possible new RE loan.
Palau	RE policy status not known
Solomon Islands	Donors (probably Australia or new Zealand) are developing a master plan for power development and a separate RE policy may not be required
Samoa	The draft national energy policy has an objective that all Samoans are to have access to electricity within 5 years. Samoa is well over 90% electrified and probably does not require an explicit RE policy.
Tonga	Tonga has prepared a draft RE policy. A considerable number of diesel-fuelled systems are going into remote island groups (Ha'apai & Vava'u) but without a clear policy framework.
Tuvalu	The Tuvalu Solar Electricity Cooperative Society is currently being restructured. There is a need for a consistent policy covering small diesel-based and renewable systems.
Vanuatu	There has reportedly been a recent RE policy review but no details are available.

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