United Nations Development Programme

United Nations Development Programme
Country: Kiribati
Project Document

UNDAF Outcome(s):	4.0 - Sustainable Environmental Management
Expected CP Outcome(s):	Environmental sustainability and sustainable energy are mainstreamed into regional and national policies, planning frameworks and programmes
Expected CPAP Output(s):	Environment mainstreamed into key national policy areas and plans including strengthened national and local capacities for improved access and management of multi-lateral environmental agreements and reporting requirements (including Exclusive Economic Zone (EEZ) joint agreements)
Implementing partner:	Kiribati Solar Energy Company Limited (KSEC Ltd)
Responsible Parties:	UNDP Fiji Multi-Country Office (MCO)

Description

Lessons learned from the increasing use of solar photovoltaic stand-alone systems in the outer islands of Kiribati calls for an effective training programme for island technicians. The training programme proposed through this project would enable Kiribati to address the sustainability of maintaining solar photovoltaic stand-alone systems by island technicians. The outputs of this project will be a refresher training programme for technician supervisors, training programme for island technicians, increased number of trained island technicians, and a resource mobilization plan for replicating best practices to other island communities.

Programme Period:	2008 - 2012
CPAP Programme Component:	Outcome 4.1.1.1
Project Title:	Maintaining Renewable Energy Systems in Kiribati through Technical Training
Atlas Award ID:	TBA
Start Date:	1/01/08
End Date:	31/12/09
PAC Meeting Date	Feb 2008

Estimated annualized budget:	US$35,000
Total resources required	US$35,000
Total allocated resources:	US$35,000
• Regular	US$35,000
• Other:	
○ EU EDF8	AUD 20,945
○ PIGGAREP	USD 55,800
Unfunded budget:	N/A
In-kind Contributions	N/A

Agreed by (Implementing Partner, KSEC Ltd): CEO 24.02.09

Agreed by UNDP: RR a.i. 26.02.2009

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Agreed by UNDP:

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Narrative

PART I. SITUATION ANALYSIS

1. Background

Kiribati recognizes the need for sustainable renewable energy utilities and the need to improve capacities in an equitable manner focusing on the outer islands to help offset heavy reliance on petroleum products and the resultant burden on their economy. Kiribati's national development strategy stressed the importance of environmental considerations in national development. Kiribati's recent Environment Act (1999) and the additional Environmental Regulations (2001) provide the framework to encourage efforts to safeguard Kiribati's environment, including the promotion of use of renewable energy resources.

The country's interest and commitment to other forms of energy is evidenced by efforts to develop power generation, particularly solar energy in recent years. The use of new and renewable energy sources, particularly solar photovoltaics (PV) for outer islands electrification in Kiribati dates back to the early 1980's. While the early PV projects were mostly for demonstration purposes, the Government of Kiribati recognized that the technology was appropriate for the environment and people. Political commitment was translated in 1984 through the establishment of the Kiribati Solar Energy Company Limited (KSEC Ltd) by the Foundation for the Peoples of the South Pacific (FSP) for development of photovoltaics to provide electricity to rural areas of Kiribati. Though initially privately owned by the FSP during its developmental stages, the Government of Kiribati took ownership in late 1980s, which is now a government-owned company responsible for providing electricity services in the outer islands and importing, reselling, installing and maintaining PV systems in Kiribati. KSEC's initiative has helped Kiribati meet basic electricity needs particularly for lighting in rural areas in an efficient, less expensive, and reliable manner. Interest in PV systems has increased in rural communities accompanied by escalating demands. This is due to increasing awareness on the benefits of the solar PV systems, particularly in health, economic savings, and education, and the limitless potential for the use of solar PV in Kiribati as a simple means of meeting electrical power needs and access to energy in rural household populations. The financial and technical advantages of solar systems are manifold: it only requires a one-time capital investment with low operating and maintenance costs, and the modular systems can be specifically sized to fit the needs of individual households. Moreover, once technical barriers to recycle the batteries are addressed, there is little potential for environmental damage.

Lessons learnt by the KSEC Ltd initiatives provide insight into the following: (i) a workable partnership between the private sector, the Government of Kiribati and international agencies to provide affordable sustainable energy to low-income households; and (ii) delivery of services affordable to the rural population of Kiribati at a AU$9 to $14 monthly fee that KSEC Ltd is sufficiently confident to expand to more outer island areas.

As one of Kiribati's development partners, UNDP is guided by programmatic interventions contained in the United Nations Development Assistance Framework (UNDAF) and the Multi-Country Programme Document 2008-2012. This resulted from in-country consultations that identified four thematic outcomes that could be supported by UNDP. In the fourth outcome of Sustainable Environmental Management, support for capacity development to mainstream environmental sustainability was identified as one of the key outcomes. The three corresponding indicators were for: (i) an increased percentage of households with access to electricity; (ii) an increased percentage of island villages with trained technicians; and (iii) an increase number of women and children with access to better lighting.

2. UNDP's Experience with Renewable Energy and opportunities for future assistance

The UNDP Fiji Multi-Country Office (MCO) was a co-operating agency in the KSEC Ltd initiative and assisted with technical training of KSEC Ltd personnel on PV systems and management training on accounting, billing, spare parts and inventory. The entire initiative, known as Renewable Energy Service Company (RESCO), is by far one of the most successful in the Pacific region which resulted in the training of personnel in instrumentation, procurement, installation of hard/software and project management. In addition, the provision of electricity had a tremendous impact on the livelihoods of I-Kiribati by providing opportunities for better lighting, improved health and income-generating activities.

UNDP can help increase the impact of this already successful initiative through: (i) support towards development of a new release of a RESCO Manager; and (ii) training of technicians and staff at the headquarters on how to run it. This would improve the reliability and long term viability of the service while also improving the life of women and children who will benefit most from accessing modern sustainable energy services.

3. Project impact on the productive utilisation of RE

The challenges involved in providing rural electrification services by means of stand alone photovoltaic systems have been occurring in the following sequence:

- **Technological:** this challenge occurred in the 60s, when the technology was not fully perfected, and by the late 70s the challenge was mostly solved. At this time, the expertise involved in the implementation of rural electrification projects were electrical engineers, who closely monitored the technology and solved the different technical problems that arose.
- **Financial:** Once the technological challenge was overcome, the next main constraint was financial, that is, to secure the investment required to finance an expensive piece of equipment. The challenge became evident during the 70s, a decade that started with the price per barrel at around $3 and ended with the price at $37.42, after two consecutive oil crises (73 and 79). The increase in oil price made photovoltaic technology more competitive, creating the consensus that enabled to dedicate the funding required for the expansion of the PV technology. In Kiribati, this global consensus brought about the formation of the KSEC in 1984.
- **Institutional:** Once the technological and financial constraints were solved, and both technology and required funds became more accessible, the next challenge was institutional. The failure of most of the projects implemented during the 80s demonstrated the need to define an institutional structure that could ensure the long term sustainability of the service. For example, by the late 80s KSEC had sold a total of of 270 PV systems, with 90% of them only marginally operational or not in use at all. This institutional crisis brought KSEC to bankruptcy, which showed that the private market oriented approach to PV rural electrification was not a success in Kiribati. Assistance was sought from the South Pacific Institute for Renewable Energy (S.P.I.R.E.) and at that time Mr Herbert Wade (responsible for the technical aspects of the RESCO Manager project) recommended that the company be converted from a sales oriented organization to a service organization based around a rural electricity utility concept. This is known as a Renewable Energy Service Company or RESCO.
- **Administrative:** By the early 90s the institutional problems had been solved, and the company was able to successfully install and maintain a total of 310 solar home systems. This was done through two consecutive projects (JICA 92 and EU94), and by the early 00s most of these systems were still operational. By then the institutional approach implemented in the early 90s had proven to be a total success, but then the company encountered a new challenge: *administrative*. As a result of the new funding (EU EDF8), the installed capacity would increase fivefold and the number of islands sevenfold. With the existing administrative set-up, the KSEC was not going to be able to maintain the extra

1,700 solar home systems and 100 community systems to be installed in all the 17 islands of the Gilbert atoll plus Banaba. This is how RESCO Manager came into existence. But with the new EU (EDF10) funding, which aims to double the existing installed capacity, the KSEC will need to keep improving the current administrative set-up and the software application that made it possible.

How does all this impact on the productive utilisation of RE? In the past decade, the KSEC, as a pioneering RESCO, has encountered the same problems that other RESCOs will encounter in the near future, when their initial installed capacity starts expanding as a result of **(1)** becoming more familiar with the technology, **(2)** obtaining the necessary funding and **(3)** choosing the appropriate institutional structure. The current version of RESCO Manager was designed with the EU04 (EDF8) project in mind, and not as a software application to be utilised by other RESCOs. Even if the software is to be used by KSEC only, it has a clear limitation: *the need for information between the headquarters and the outer islands to be exchanged in paper format only.* Therefore, by programming the next version of the software in open source, public domain and web based, it will be possible for other RESCOs in the Pacific and worldwide to overcome the administrative challenge that they are already facing or are about to encounter. Only then, the new wave of funding committed in the recent years as a result of an increased awareness in global warming issues, its causes and effects, and its possible solutions (among them RE) will find fertile ground to germinate and turn it into successful rural electrification projects that reduce total CO2 emissions.

4. Benefits of RESCO Manager Software Application

Currently, more than 2,000 solar PV home systems exist in the outer islands of Kiribati and their maintenance and operations remain the responsibility of the KSEC Ltd. The success of solar PV stand-alone home systems depends on three factors: (i) appropriate system design; (ii) proper installation; and (iii) reliable and consistent maintenance. RESCO Manager is the most appropriate software application as it is designed to assist all levels of implementation:

1. Prior to purchase of equipment: for selecting optimal system specifications;
2. During installation: for successful commissioning of renewable energy equipment; and
3. Post installation: for successful operation, maintenance and troubleshooting of equipment.

RESCO Manager was first implemented in 2005 to coordinate logistics for increasing the quantity and coverage of solar systems from 300 to 2,100 and three to 18 islands respectively. Since then the software has proven to be one of the key success factors in the operations of KSEC Ltd. Since July 2007, the RESCO Manager is being refined to suit versatile conditions funded by the European Union. KSEC Ltd is now seeking co-financing from regional renewable energy project (PIGGAREP) and UNDP through this project for programming and implementation, as outlined in Annex III. Through the proposed project, financial assistance will be provided by UNDP Fiji MCO to specifically achieve the following output:

Co-finance the design and implementation of a web-based version of RESCO Manager software applications.

Through this UNDP assistance, additional resources would be mobilized from potential funding sources to Kiribati. UNDP assistance would compliment the ongoing PIGGAREP, which focuses on the management and decentralizing of RESCO to the outer islands.

PART II. SCOPE AND STRATEGY

In accordance with the request by the Government of Kiribati at the UNDAF consultation in early 2007, the UNDP Fiji MCO will provide financial assistance to the Government of Kiribati through the KSEC Ltd. The proposed project will be two-pronged:

1) develop a training programme that emphasizes greater focus on capacity to ensure sustainability in solar PV recipient communities; and
2) provide a resource mobilization plan approved by key partners that will enable replication of maintenance of solar PV stand-alone home systems.

Key activities of this project are as follows:

1. The design of the new RESCO Manager involving logistics, technical and financial modules;
2. The implementation of RESCO Manager involving technical assistance and training during implementation (development of training programme and conduct of workshop for technician supervisors and island technicians, establishment of a monitoring and evaluation system for trained island technicians over a three-month period, revising of training programme to measure effectiveness, and adapting revised training programme for other island communities); and
3. Replication of best practices to other island communities through resource mobilization.

Once the initiative is completed, increased access in the outer islands should provide economic gains, improve local capacity to guarantee reliable access to energy, allow access to better lighting for women and children, and provide more opportunities to develop activities that could not have been undertaken without access to electricity.

The role of UNDP would be to finance the establishment of a sustainable capacity development training programme to ensure the long-term sustainability of solar PV stand-alone systems in the outer islands of Kiribati. Partnerships involve UNDP (as funding source), Kiribati KSEC Ltd (for overall project execution), Kiribati Ministry of Works and Energy and respective island councils (for realization of project benefits) and possibly CROP (for technical assistance).

ANNUAL WORK PLAN BUDGET SHEET

Year: 2009

EXPECTED OUTPUTS *And baseline, associated indicators and annual targets*	PLANNED ACTIVITIES *List activity results and associated actions*	TIMEFRAME Q2 – Q4, 2009				RESPONSIBLE PARTY	PLANNED BUDGET		
		Q1, 2009	*Q2, 2009*	*Q3, 2009*	*Q3, 2009*		*Funding Source*	*Budget Description*	*Amount (USD)*
	1. RESCO Manager software application designed								
Output: Software application designed, programmed and implemented *Baseline:* Non-existence of web-based version of RESCO Manager and limited financial assistance to extend training to other island communities *Indicators:* RESCO Manager successfully implemented and staff properly trained; one donor round-table to identify resource partners by end of Quarter 2, 2009. *Targets*: Application designed, programmed and implemented.	1.1 Logistics module designed - Establish tracking systems for fully traceable and non-traceable items - Draft report and circulate for comments - Finalise report and submit to UNDP	X X X				Kiribati Solar Energy Company Ltd (KSEC Ltd)	UNDP	71400 Contractual Services	4,050
	1.2 Technical module improved - Define variables to be monitored, monitoring conditions, entry quantities for each variable and linkages - Draft report and circulate for comments - Finalise report and submit to UNDP		X X X			Kiribati Solar Energy Company Ltd (KSEC Ltd)	UNDP	71400 Contractual Services	4,050
	1.3 Financial module improved - Establish ideal method of fee payment in outer islands - Draft report and circulate for comments - Finalise report and submit to UNDP		X X X			Kiribati Solar Energy Company Ltd (KSEC Ltd)	UNDP	71400 Contractual Services	4,050

Refresher training workshop, training programme, resource mobilization strategy, donor commitment to replicate best practices *Related CP outcome*: Environmental sustainability and sustainable energy are mainstreamed into regional and national policies, planning frameworks and programmes; and Kiribati communities effectively manage and sustainably use their environment, as well as natural and cultural resources	2. RESCO Manager software application implemented								
	2.1 Technical assistance provided to KSEC Ltd - Training to headquarters staff on the technical module - Draft report and circulate for comments - Finalise report and submit to UNDP			X		Kiribati Solar Energy Company Ltd (KSEC Ltd)	UNDP	71400 Contractual Services	11,200
								71600 Travel	2,450
	2.2 Training programme for island technicians trialled in Abaiang through two training workshops - Organize agenda, confirm participants and venue - Conduct training workshop - Draft report and circulate for comments - Finalise report and submit to UNDP			X X X X		Kiribati Solar Energy Company Ltd (KSEC Ltd)	UNDP	71600 Travel	2,800
								74500 Miscellaneous Expenses	200
	2.3 Impact of trial training programme monitored over 3-month period - Document findings and recommend areas for improvement - Circulate draft monitoring and evaluation report for comments - Finalize monitoring and evaluation report and submit to UNDP			X X X		Kiribati Solar Energy Company Ltd (KSEC Ltd)	UNDP	71400 Contractual Services	900
								74500 Miscellaneous Expenses	200
	2.4 Training programme for island technicians reviewed through stakeholder workshop					Kiribati Solar Energy Company Ltd (KSEC Ltd)	UNDP	71400 Contractual Services	1,000

	- Conduct review workshop on the use of RESCO Manager for technical monitoring of PV Systems			X X				74500 Miscellaneous Expenses	200
	2.5 Training programme for island technicians revised - Consolidate comments from review workshop and revise training programme as required - Circulate revised training programme for comments - Finalize revised training programme and submit to UNDP			X X X		Kiribati Solar Energy Company Ltd (KSEC Ltd)	UNDP	71400 Contractual Services 74500 Miscellaneous Expenses	900 200
	3. Resource mobilization strategy developed and agreed to by key stakeholders								
	3.1 Project benefits advocated through media - Finalize press releases - Raise profile through Internet and specialised press - Document best practices				X X X	Kiribati Solar Energy Company Ltd (KSEC Ltd)	UNDP	71400 Contractual Services	900
	3.2 Resource mobilization strategy finalized - Obtain list of communities to replicate best practices - Finalize regional resource mobilization strategy and submit to UNDP				X X X	Kiribati Solar Energy Company Ltd (KSEC Ltd)	UNDP	71400 Contractual Services	900

	3.3 Replication of best practices included in donor roundtable discussions - Confirm inclusion of topic in roundtable agenda - Promote best practices through resource mobilization strategy - Document outcomes and way forward				X X X	Kiribati Solar Energy Company Ltd (KSEC Ltd)	UNDP	71400 Contractual Services	1,000
TOTAL									**USD35,000**

MANAGEMENT ARRANGEMENTS

Roles and Responsibilities

Establishing an effective project management structure is crucial for the project's success. The project has need for direction, management, control and communication and has been designed according to the following project organisation structure.

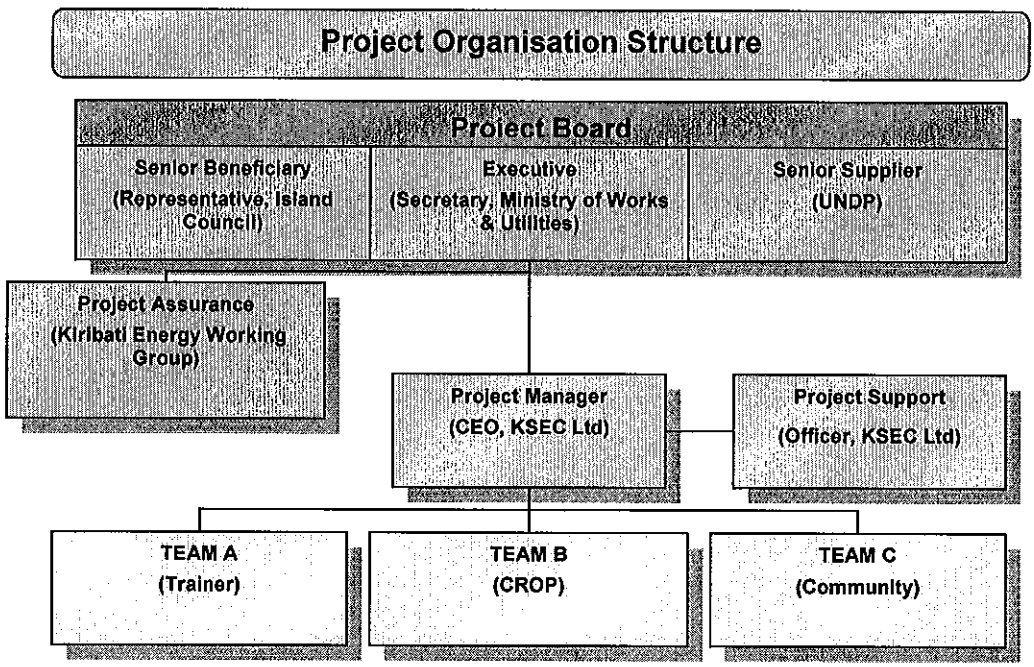

Figure 1: Project Organisation Structure

As explained in Annex II and illustrated in Figure 1 above, a Project Board will be responsible for making executive management decisions for the project and will comprise of the Secretary, Ministry of Public Works & Utilities as the Executive to chair the group, the UNDP as Senior Supplier to provide guidance on the technical feasibility of the project, and a representative of the Island Council as the Senior Beneficiary to ensure the realization of project benefits from the beneficiaries' viewpoint. This group shall provide guidance to the Project Manager, the Chief Executive Officer of KSEC Ltd when needed including project revisions. Reviews by this group to ensure quality programming is undertaken are to be made at designated decision points during the running of the project, or as necessary when raised by the Project Manager. This group is consulted by the Project Manager for decisions when project tolerances have been exceeded.

The Kiribati Solar Energy Company Limited will be the executing agency for the project and will have responsibility for facilitating project coordination with other relevant departments, agencies and organizations in Kiribati. The KSEC Ltd will ensure the timely and effective delivery of project outputs and the proper use of project resources.

The Project Manager will be responsible to the UNDP and to the Project Assurance body, the Kiribati Energy Working Group (KEWG), for the effective implementation of the project. The KSEC Ltd will appoint its Officer as the National Project Coordinator (NPC) who will be largely responsible for the overall planning and implementation of the project, coordination with the Project Manager and other stakeholders and for the preparation of reports (including financial reports) to UNDP and the KEWG. As far as possible, consideration of previous and ongoing projects, studies and reports relating to renewable energy technologies will be considered.

Financial Arrangements

The Preparatory Assistance (PA) Phase of the Project will be nationally executed (NEX) by the national Government of Kiribati through the Kiribati Solar Energy Company Limited, where the focal point of contact will be the Chief Executive Officer, KSEC Ltd. The KSEC Ltd will:

- Be responsible for the financial control of the project through the NEX modality of UNDP;
- Sign-off on all budget and work-plan revisions and maintain project accounts and financial responsibility;
- Work with the project and assume responsibility for entering into necessary work arrangements with other national, state and regional organizations for efficient and effective project implementation;
- Support the project by providing guidance and authority to engage services consistent with the objectives of the project; and
- Receive advances equivalent to the financial needs of the project as indicated in the quarterly work plans provided.

Funds will be released to the Development Account of the Ministry of Finance and Planning. The Ministry of Finance and Planning will be responsible for the initial warrant and disbursement of funds in accordance with the work plan and the project document. Further cash advances will be contingent upon timely reporting of expenditure by the KSEC Ltd to the UNDP MCO, Fiji.

MONITORING FRAMEWORK AND EVALUATION

In accordance with the programming policies and procedures outlined in the UNDP User Guide, the project will be monitored through the following:

Within the annual cycle

- On a quarterly basis, a quality assessment shall record progress towards the completion of key results, based on quality criteria and methods captured in the Quality Management table below.
- An Issue Log shall be activated in Atlas and updated by the Project Manager to facilitate tracking and resolution of potential problems or requests for change.
- Based on the initial risk analysis submitted (see Annex I), a risk log shall be activated in Atlas and regularly updated by reviewing the external environment that may affect the project implementation.
- Based on the above information recorded in Atlas, a Quarterly Progress Reports (QPR) shall be submitted by the Project Manager to the Project Board through Project Assurance, using the standard report format available in the Executive Snapshot.
- A project Lesson-learned log shall be activated and regularly updated to ensure on-going learning and adaptation within the organization, and to facilitate the preparation of the Lessons-learned Report at the end of the project.
- A Monitoring Schedule Plan shall be activated in Atlas and updated to track key management actions/events.

Annually

- **Annual Review Report**. An Annual Review Report shall be prepared by the Project Manager and shared with the Project Board and the Outcome Board. As a minimum requirement, the Annual Review Report shall consist of the Atlas standard format for the QPR covering the whole year with updated information for each above element of the QPR as well as a summary of results achieved against pre-defined annual targets at the output level.
- **Annual Project Review**. Based on the above report, an annual project review shall be conducted during the fourth quarter of the year or soon after, to assess the performance of the project and appraise the Annual Work Plan (AWP) for the following year. In the last year, this review will be a final assessment. This review is driven by the Project Board and may involve other stakeholders as required. It shall focus on the extent to which progress is being made towards outputs, and that these remain aligned to appropriate outcomes.

Quality Management for Project Activity Results

OUTPUT: Software application designed and programmed		
Activity Result 1 (Atlas Activity ID)	RESCO Manager software application designed and programmed	Start Date: September 2009 End Date: July 2009
Purpose	*To design and programme logistics, technical and financial modules of RESCO Manager software applications*	
Description	*Planned actions are outlined in AWP and include designing of logistics, technical and financial modules.*	

Quality Criteria *How/with what indicators the quality of the activity result will be measured?*	**Quality Method** *Means of verification. What method will be used to determine if quality criteria has been met?*	**Date of Assessment** *When will the assessment of quality be performed?*
Endorsement of RESCO Manager software application by stakeholders prior to implementation	On-line launching and easy access by all project stakeholders	End of September 2009

OUTPUT: Software application implemented		
Activity Result 2 (Atlas Activity ID)	RESCO Manager software application implemented	Start Date: April 2009 End Date: September 2009
Purpose	*To successfully implement RESCO Manager software application*	
Description	*Planned actions are outlined in AWP and include technical assistance and finalized training programme.*	

Quality Criteria *How/with what indicators the quality of the activity result will be measured?*	**Quality Method** *Means of verification. What method will be used to determine if quality criteria has been met?*	**Date of Assessment** *When will the assessment of quality be performed?*
Draft training manual	Timely circulation and receipt of comments from stakeholders	November 2009
Implementation Strategy	Timely circulation and receipt of comments from stakeholders	November 2009
Follow-up workshop	Register of workshop participants, Active monitoring and review of programme, timely finalization	December 2009
Report	Timely circulation of draft and submission of final version to UNDP	December 2009

OUTPUT: Training programme for renewable energy technicians developed for replication to other communities through resource mobilization		
Activity Result 3 (Atlas Activity ID)	3. Resource mobilization strategy developed and agreed to by key stakeholders	Start Date: October 2009 End Date: November 2009
Purpose	*To ensure that resource mobilization strategy and replication of best practices is discussed at donor roundtable meetings.*	
Description	*Planned actions are outlined in AWP and include advocacy exercise, requesting for inclusion in the donor roundtable meeting and documenting discussion outcomes and way forward.*	

Quality Criteria *How/with what indicators the quality of the activity result will be measured?*	**Quality Method** *Means of verification. What method will be used to determine if quality criteria has been met?*	**Date of Assessment** *When will the assessment of quality be performed?*
Subject included in roundtable agenda	Agreed by government	December 2009
Report of discussions and way forward	Timely submission to UNDP	December 2009

LEGAL CONTEXT

This document together with the CPAP signed by the Government of Kiribati and UNDP which is incorporated by reference constitute together a Project Document as referred to in the Standard Basic Assistance Agreement (SBAA) and all CPAP provisions apply to this document.

Consistent with the Article III of the SBAA, the responsibility for the safety and security of the implementing partner (KSEC Ltd) and its personnel and property, and of UNDP's property in the implementing partner's custody, rests with the implementing partner.

The implementing partner shall:

a) put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried;

b) assume all risks and liabilities related to the implementing partner's security, and the full implementation of the security plan.

UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.

The implementing partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via http://www.un.org/Docs/sc/committees/1267/1267ListEng.htm. This provision must be included in all sub-contracts or sub-agreements entered into under this Project Document.

ANNEX I: RISK ANALYSIS

Project Title: Maintaining Renewable Energy Systems in Kiribati through Technical Training	Award ID: To be decided	Date: 01/08/08

#	Description	Date Identified	Type	Impact & Probability	Countermeasures / Mngt response	Owner	Submitted, updated by	Last Update	Status
1	UNDP's allocated TRAC-1 funding allocation is insufficient to fund PA project	Project Document Stage: 01/08/08	Financial	Impact: Alternate or additional source of funding will need to be sourced, resulting in a delay in project commencement. Probability: Dependent upon resources committed to by KSEC and cost of a consultant. Considered unlikely. Rated 2.	KSEC to commit resources to project and tendering process to determine 'value for money' consultant. Rigorous monitoring to avoid over-expenditure.	UNDP	Emma Mario	01/08/08	Work plan designates costs associated with each activity.
2	Insufficient personnel available within KSEC to implement project	Project Document Stage: 01/08/08	Operational	Impact: Delay in progress of PA project, hence low delivery. Probability: Moderately likely due to under-resourcing within KSEC. Rated 3.	UNDP to provide sufficient support to KSEC where appropriate to enable timely delivery of project.	UNDP KSEC Ltd	Emma Mario	01/08/08	KSEC is under-resourced, however view this as an important project and is willing to commit time to the project execution.
3	Suitable technical personnel not available for timely project execution	Project Document Stage: 01/08/08	Operational	Impact: Project will have to be delayed to accommodate availability of suitable consultant OR	Choose a consultant who is available to execute project when proposed and aid	UNDP KSEC Ltd	Emma Mario	01/08/08	Tenders for consultants have not yet been advertised.

				quality of project delivered is compromised. Probability: Unknown since tenders have not yet been advertised for consultant, but considered unlikely. Rated 2.	efficient completion of project.				Tenders will be finalised once project commences.
4	Suitable participants to review training programme and attend training workshop not available for timely project execution	Project Document Stage: 01/08/08	Operational	Impact: Project will have to be delayed to accommodate availability of suitable participants OR quality of project delivered is compromised. Probability: Unknown since project has not commenced and activity timeframes are not confirmed, but considered unlikely. Rated 2.	Contact community participants as soon as project commences, confirm review/training timeframes and advocate benefits of participation.	UNDP KSEC Ltd	Emma Mario	01/08/08	Timeframe for review of training programme and training participants have not yet been confirmed. This will be finalised once project commences.
5	Suitable participants for donor roundtable not available to agree on mobilizing resources for project replication to other communities	Project Document Stage: 01/08/08	Operational	Impact: Project will have to be delayed to accommodate availability of suitable participants OR quality of project delivered is compromised. Probability: Unlikely since donor roundtable is an annual event. Rated 2.	Promote visibility and benefits of project once commenced and ensure that project discussion is included in donor roundtable.	UNDP KSEC Ltd	Emma Mario	01/08/08	Timeframe for annual donor roundtable is known. Project needs to be included in discussions.
6	Project not aligned with UNDP requirements for TRAC-1 allocation	Project Brief Stage: 31/01/08	Organizational	Impact: Project does not receive funding to go ahead. Probability: Highly unlikely given that funding has already been designated for project in Annual Work Plan (AWP). Rated 1.	Discussions during project formulation with those in authority to designate funds prior to discussions with local organizations.	UNDP	Emma Mario	28/02/08	Approved in 2008 Annual Work Plan at PAC and L-PAC.

ANNEX II: DEFINITIONS FOR MANAGEMENT ARRANGEMENTS

Roles and Responsibilities

Establishing an effective project management structure is crucial for the project's success. The project has need for direction, management, control and communication and has been designed according to the following project organisation structure.

Project Board: The Project Board is the group responsible for making, by consensus, management decisions for a project when guidance is required by the Project Manager, including recommendation for UNDP / Implementing Partner approval of project plans and revisions. In order to ensure UNDP's ultimate accountability, Project Board decisions should be made in accordance to standards that shall ensure:

- development indicators are met;
- best value for money;
- fairness;
- integrity;
- transparency; and
- effective international competition.

In case a consensus cannot be reached within the Board, final decision shall rest with the UNDP Programme Manager. In addition, the Project Board plays a critical role in UNDP commissioned project evaluations by quality assuring the evaluation process and products, and using evaluations for performance improvement, accountability and learning. Project reviews by this group are made at designated decision points during the running of the project, or as necessary when raised by the Project Manager. This group is consulted by the Project Manager for decisions when Project Manager's tolerances (normally in terms of time and budget) have been exceeded (flexibility). Based on the approved Annual Work Plan (AWP), the Project Board may review and approve project quarterly plans when required and authorises any major deviation from these agreed quarterly plans. It is the authority that signs off the completion of each quarterly plan as well as authorises the start of the next quarterly plan. It ensures that required resources are committed and arbitrates on any conflicts within the project or negotiates a solution to any problems between the projects and external bodies. In addition, it approves the appointment and responsibilities of the Project Manager and any delegation of its Project Assurance responsibilities.

This group contains three roles:

Executive: An individual to chair the group, who represents the Government Cooperating Agency, in this case the Kiribati Solar Energy Limited (KSEC Ltd). The KSEC Ltd is the agency responsible for providing energy services to outer islands. The Executive provides oversight role to the Executing Agency that will have the overall responsibility for project execution and is responsible for project deliverables and accountable to Government and UNDP.

Senior Supplier: An individual or group representing the interests of the parties concerned which provide funding and/or technical expertise to the project. The Senior Supplier's primary function within the Project Board is to provide guidance regarding the technical feasibility of the project and for this project is the UNDP.

Senior Beneficiary: An individual or group of individuals representing the interests of those who will ultimately benefit from the project. The Senior Beneficiary's primary function within the Board is to ensure the realisation of project results from the perspective of project beneficiaries. The Senior Beneficiary for this project will be the Director of Energy Planning Unit and a representative of the Island Council.

The Project Board supports the following roles:

Project Assurance: Project Assurance is the responsibility of each Project Board member; however the role can be delegated. The project assurance role supports the Project Board by carrying out objective and independent project oversight and monitoring functions. This role ensures appropriate project management milestones are managed and completed. Project Assurance has to be independent of the Project Manager; therefore, the Project Board cannot delegate any of its assurance responsibilities to the Project Manager. Project Assurance for this project will be undertaken by the Kiribati Energy Working Group (KEWG).

Project Manager: The Project Manager has the authority to run the project on a day-to-day basis on behalf of the Implementing Partner, KSEC Ltd, within the constraints laid down by the Project Board. The Project Manager's prime responsibility is to ensure that the project produces the results (outputs) specified in the project document, to the required standard of quality and within the specified constraints of time and cost. The Implementing Partner appoints the Project Manager, in this case the Director of KSEC Ltd, who should be different from the Implementing Partner's representative in the Outcome Board. The Implementing Partner is the entity responsible and accountable for managing the project, including the monitoring and evaluation of project interventions, achieving project outputs, and for the effective use of UNDP resources. The Implementing Partner may enter into agreements with other organisations or entities to assist in successfully delivering project outputs. Possible Implementing Partners include government institutions, other eligible UN agencies and Inter-governmental organisations (IGOs), UNDP, and eligible NGOs. Eligible NGOs are those that are legally registered in the country where they will be operating. KSEC Ltd has been identified as an Implementing Partner based on an assessment of their legal, technical, financial, managerial and administrative capacities that will be needed for the project. In addition, their ability to manage cash must be assessed in accordance with the Harmonised Approach for Cash Transfers (HACT). The most recent capacity assessment (February 2008) had a total rating of 90%, indicating very high capacity of KSEC Ltd to successfully implement the project.

Project Support: The Project Support role provides project administration, management and technical support to the Project Manager as required by the needs of the individual project or Project Manager. It is necessary to keep Project Support and Project Assurance roles separate in order to maintain the independence of Project Assurance. Project Support will be provided by an Assistant Officer of KSEC Ltd.

Teams: Different teams will be formed during the project to work on and deliver different activities identified above on the Project Annual Work Plan Budget Sheet. The Terms of Reference (TOR) for the Consultant is included as Annex II. Another possible team could comprise representatives from the Council of Regional Organisations of the Pacific (CROP). The activities to be assisted by this team will be determined by the depth of knowledge of the contracted consultant, along with the knowledge of the UNDP and Kiribati Solar Energy Company Limited (KSEC Ltd) representatives.

ANNEX I: PROGRAMING RESCO MANAGER AS A WEB BASED APPLICATION

1. Project synapses

Start: July 2007

End: July 2010

Objectives: Re-programme RESCO Manager as a web based application

Language: Python

Platform: Windows, Linux/Unix, Mac OS X, OS/2, Amiga, Palm Handhelds, and Nokia mobile phones.

Licence: GNU open source

Domain: Public

Brief description: RESCO Manager is a software application to assist Renewable Energy Service Companies (RESCOs) in the selection, installation, operation and maintenance of renewable energy equipment. The application is made out of three modules: financial, technical and logistics, and designed to assist in:

- utility equipment (equipment owned by the RESCO or a third body and leased to the user in exchange of a fee) and
- private maintenance (equipment owned by the household and maintained by the RESCO).

Countries involved

- Republic of Kiribati
- Federated States of Micronesia (FSM)

Team members

1. Marc Torra Griso - Project coordinator and responsible for designing the business system.
2. Jordi Llonch – System designer and programmer.
3. Software Factory Ltd – in charge of tailoring standard application and programming reports.
4. Herb Wade – in charge of improving the technical module and assisting in the design of the business system.
5. Peter Konings – Responsible for implementation in FSM and assisting in the design of business system.

Required funding UNDP: USD 35,000

Project	Funding	Year
EU04 (EDF8)	AUD 20,945	2007
PIGGAREP	USD 55,800 + 2 air tickets and perdiems	2009
UNDP	USD 35,000	2009
EU EDF9 - REP5	EUR 4,800	2009
REP5 time	EUR 8,000	2009
To be identified*	USD 57,000	2009/10

* Funding required for the design, programming and implementation of the application in Kiribati has already been committed. Funding still to be identified is for the successful implementation of the software application in FSM.

2. Background information

The Kiribati Solar Energy Company is the oldest Renewable Energy Service Company (RESCO[1]) in the Pacific and one of the oldest worldwide.

By 2001 the KSEC maintained 310 solar home systems in the islands of North Tarawa, Marakei and Nounouti. The systems had been installed during two previous projects:

- JICA92 installed 50 systems in North Tarawa, and
- EU94 installed 260 extra systems in North Tarawa, Marakei and Nounouti.

In August 2001 the inception phase of the European Union project "*Solar energy for the outer islands*" began (thereafter called EU04). As a result of this project:

1. The installed capacity was going to increase seven-fold, from the existing 310 SHS to 2,100 SHS plus 96 community buildings. In terms of installed capacity, the increase would be from 31,000 Wp to around 250,000 Wp
2. The number of islands to be electrified was going to increase six-fold, from 3 to 18.

This is why KSEC and the technical assistance (TA) in charge of implementing EU04 quickly realised that the increase in size could jeopardize the company's ability to manage its newly acquired capacity. If this happened, the company could choke on its own success. To avoid this, KSEC underwent two major changes:

- Restructuring and downsizing the headquarters by decentralising the decision making process from the headquarters to villages and islands and organising all the company activities into 15 procedures,
- Computerising the accounting procedures and implementing RESCO Manager, a tailored application for monitoring and managing the photovoltaic (PV) systems.

Why have a tailored application to manage the solar systems? Soon after the EU04 project started, the project's technical assistance realised that to computerise the accounting with a standard software package (e.g. MYOB) and define clear administrative procedures was not going to be enough to successfully manage the business, with the new capacity to be installed. Some sort of software for the installation and management of solar systems was also needed, and this software was not ready available as a standard package. Therefore it was necessary to create it.

In 2003 the first version of the software was released as a MS Access database and it was named **RESCO Manager I**. By February 2004 it was evident to the TA and KSEC LTD that the current version of RESCO Manager needed to be migrated to a more reliable database engine and interface. This is why in October 2004 the KSEC LTD obtained quotations from six Fijian companies. Two weeks later Software Factory Ltd, from Suva, was selected on the basis of being the company charging the most reasonable fee. In 2005 RESCO Manager was successfully migrated from its current MS Access environment into SQL Server, with an interface programmed in Microsoft .Net environment and C#(C Sharp) programming language. The new release was called **RESCO Manager II.**

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1 A RESCO offers rural electrification services in exchange of a monthly fee.

During the same year the application was used to coordinate the installation of 1,700 solar home systems in all the 18 islands of the Gilbert Atoll. By the end of 2005, during the last visit of the TA to Tarawa, **RESCO Manager II** was already managing 2,100 solar home systems and 96 community systems spread over 100 villages.

Since then **RESCO Manager II** has become the central component in KSEC's organisational structure.

3. Project objectives

The **general objective** is to design a web based software application for the installation and management of renewable energy equipment and thus contribute to the expansion of rural electrification projects (see Annex III: "Toward a Pacific Strategy for rural electrification").

The **specific objective** is to enable the KSEC to manage the future capacity to be installed under the EU EDF10 project by upgrading the current version of RESCO Manager. This objective is to be achieved by means of implementing the following three activities:

1. Reprogram the existing version of RESCO Manager as an open source and web based application, with:
    - all the improvements already agreed to by the KSEC LTD (minor improvements, logistics module and access in remote), plus
    - the new improvements that result from having a web based application (dynamic preventive maintenance and multi user access),
2. Migrate the existing data at KSEC LTD from RESCO Manager II to RESCO Manager III.
3. Train Kiribati RESCO (KSEC LTD), power utilities in FSM and FSM RESCO (GES).

4. Software description

4.1. What is RESCO Manager?

RESCO Manager is a software application RESCO Manager is designed to:

1. **Assist in selecting the optimal system specifications:** this feature is has not been implemented yet. It will be added to a future release once significant data on the individual performance of renewable energy systems has been collected.
2. **Assist during the installation and commissioning of renewable energy equipment:** RESCO Manager facilitates the logistics for the installation of large amounts of renewable energy equipment. This feature was already available in RESCO Manager II, and it was used for the installation of the 1,700 solar home systems in the 18 islands of the Republic of Kiribati Groupl. The feature is based on the FISH (First Installation Sheet), a document only required for islands without an internet connection. If there is internet, the logistics module to be added into RESCO Manager III will make the installation logistics even easier. Nevertheless it is important that the new release of RESCO Manager keeps all the features that allowed the previous version to function without an internet connection with the outer islands.
3. **Assisting during operation, maintenance and troubleshooting:** Once the RESCO has successfully installed the equipment, then operation, maintenance and troubleshooting starts. These features are described in more detail in the next section.

4.2. Modes of operation

The strategy is to reprogram RESCO Manager III as an open source, public domain and web based application.

- **Open source and public domain:** Having RESCO Manager III available in open source and public domain will greatly assist the expansion of renewable energy service companies (RESCOs) in the PICs and worldwide and thus promote renewable energy. Once migrated to open source, any RESCO will be able to access the code (known as open source), and change it in order to suit any requirement without having to pay a license or contract to the company and consultants that originally designed and programmed it (known as public domain). The new release will be easily downloadable through several websites on the internet.

- **Web based:** having the application web based will allow four modes of operation

    1. **As a RESCO Server**: this is the mode to be used by the RESCO headquarters. The RESCO Server will centralise the information for all the PV systems owned and/or maintained by the RESCO, plus it will include the modules that allow the application to manage PV systems in locations without internet access. That is, it will include all the features from the existing RESCO Manager, designed to operate without internet access from the outer islands, plus offer the new features which means the application can function in remote mode through the internet.

    2. **As an ISLAND Server**: As an island server, RESCO Manager will centralise all the data for a given island or zone, offering immediate local access to the data without needing to be connected to the internet. Data will then be synchronized with the headquarters on the background whenever there is an internet connection. In this way the application will not need to be permanently connected to the internet, nor need the internet to function.

    3. **As an INTRANET portal**: this is the access point for users and field technicians. In this way on-line access will be offered to all the islands through the island intranet. This is, the island wireless network that will allow a user to access his or her records, the telmo office (national telegraphic money transfers) to receive payments and enter telmo data, or a village technician to enter monitoring data. This will make RESCO Manager data accessible through any personal computer, including OLPCs (One Laptop per Child - low cost computers) or even any hardware with internet browsing (e.g. mobile phones, PDAs, etc.)

    4. **As a WEB portal**: this is the point for searching technical data compiled by other RESCOs. The data could be searched by using a peer-to-peer network in which RESCOs make their technical data available to other RESCOs or any third party that requires it for research purpose. These improvements could be added in the future, once extra funding is committed.4.2. Main features

4.3. Available modules

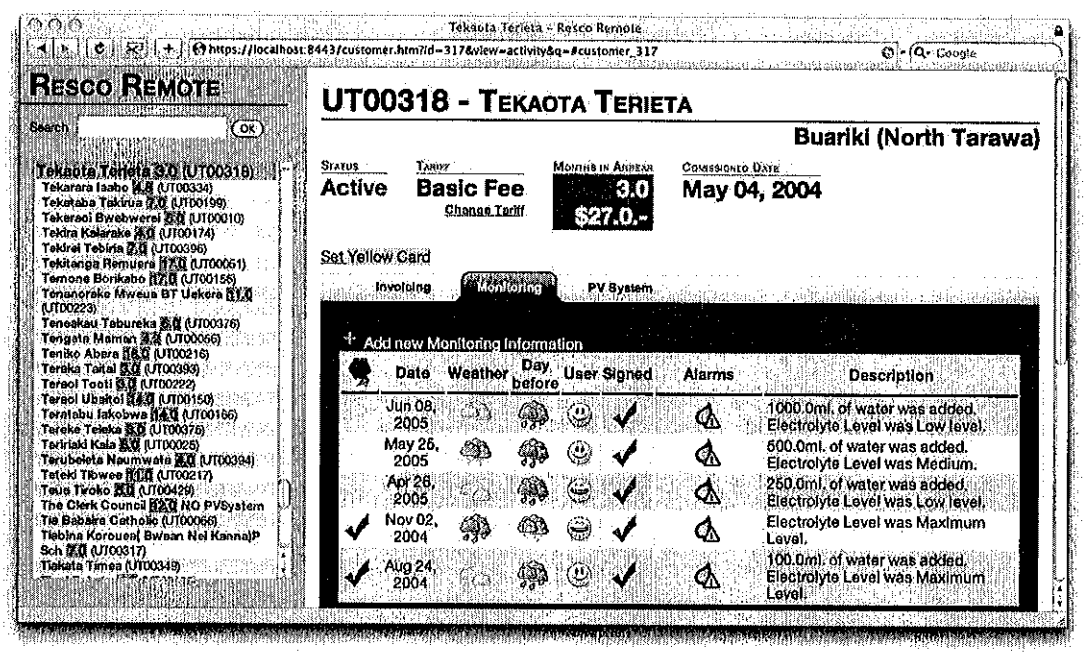
RESCO Manager III will include three modules, with all the features already existing in RESCO Manager II, the enhancements already agreed upon, plus all the new enhancements that result from making the application 100% web based.

The modules are:

1. **Technical module:** the menus related to the technical module are:

    - **PV system configuration**: This menu offers information on all the parts and components that constitute a specific RE system, with serial numbers or bar codes included for all the parts that require full traceability. With the logistics module this menu will gain in dynamism because it will be possible to select individual components in order to (1) dispose or repair them, (2) replace them, (3) add new components, or simply see all what a specific component reveals in terms of (1) times that it has failed in the past, (2) previous systems where it was installed, (3) performance compared to the same component installed in other systems, etc.

- **Monitoring**: RESCO Manager III will greatly improve monitoring too. RESCOs will be offered a set of variables to choose from for monitoring (e.g. voltage, specific gravity, water added, weather, etc). It will be possible to assign variables to specific system configurations, for example, if one system configuration has sealed batteries, the application will not ask for specific gravity or water added. Or to specific locations, for example, if one island has a weather station already providing data, the application will not ask about the weather. At the same time, it will be possible toive decide the frequency for each variable. For example, in an island with a weather station, the reading could be done on a daily basis, but if the voltage needs to be taken manually, then perhaps the ideal frequency for voltage would be once a month.
- **Dynamic preventive maintenance**: Monitoring data, PV system configuration and other relevant technical data will be sent to the central database where it will be compared with technical data coming from other locations and RESCOs. This will make possible to keep on refining the alarms for preventive maintenance. In this way, users will receive up-to-date information on what could go wrong with the system, and receive advice on the steps to overcome the problem. All this is possible because RESCO Manager will be a web based application.



- **Troubleshooting and repairs**: with the addition of the logistics module, troubleshooting and repairs will gain considerably, because repairs will not only be linked to a specific unit and its location, but to the parts and components that failed, to their brand, technical specifications, etc, Therefore the objective is to design a menu for troubleshooting and repairs that (1) assists the field technician to identify the problem, and at the same time (2) asks for information to be entered in a way that allows the application to learn and keep on refining the accuracy of its diagnoses.

2. **Financial module:** the taps related to the financial module are:
   - **Invoicing**: RESCO Manager III will allow for multiple ways to collect the fee, or the menu will not appear if there is no fee to collect. Some of the various ways the fee

can be collected are: paid by the user to the RESCO representative (e.g. field technician), to a third party (e.g. village elders), to a device (e.g. prepayment meter); or it can be transferred to the headquarters via telmo, or paid by a relative at the headquarters. The application will be designed in order to cater for all these various solutions, in a way that offers enough flexible payment options to different users, villages or islands.

- **Removal**: Removal has two options, either it is ordered from the headquarters and carried out by the field technician that is; the initiative to remove the RE system comes from the field technician. The new RESCO Manager will offer both options, but as well the possibility to decide if the RESCO wants to have both open, or just allow for one of them.
- **Direct sales:** each service centre in the outer islands becomes a point of sale and this is the menu from which sales are entered, tracked or analysed.
- **Asset depreciation:** incorporated assets need to be depreciated for tax purposes, and depreciation varies depending if the item was donated or purchased. Depreciation will offer accurate information on the amount that each item has been depreciated, in order to transfer it to the accounting application used by the RESCO.

3. **Logistics module:** the menus related to the logistics module are:
   - **Stock management**: this menu will allow to analyse the inventories in any given location or on transit.
   - **Tracking feature:** this menu will track any fully traceable item, from the time it was entered into RESCO Manager to the time it was properly disposed. In this way the RESCO will make sure that batteries and other similar components are disposed of properly.

5. Project synergies

The project has the following synergies:

With EU EDF 10 funding and the Italian Government funding:

- To make RESCO Manager accessible from the outer islands it is required to have V-SAT Internet, something that can be provided by the above mentioned projects when they electrify the 6 schools.

With OLPC Oceania:

- OLPC Oceania aims at distributing 5,000 laptop computers in the Pacific, with around 500 assigned to Kiribati. The new RESCO Manager is being designed to run on an OLPC computer, the ideal hardware for an outer island environment because they are flexible, low-cost, power efficient, responsive and durable.

6. The team

Marc Torra Griso

Project coordinator and responsible for designing the business logic

Marc is an economist who currently lives in Australia and specialises in implementing renewable energy and energy efficiency projects. He was the business management expert (BME) for the EU project "Solar energy for the outer islands" implemented in Kiribati between 2001 ands 2005 and the person from the TA that spent the most time in Kiribati. He has designed all the versions of RESCO Manager and programmed the first one in MS

Access. He has experience as logistics manager in the automotive industry and therefore he will be the person designing the logistics module also.

Jordi Llonch

System designer and chief programmer

Jordi is an entrepreneur with over 15 years experience in the information technology industry who currently lives in Morocco. He started the company AtCubic.com, specialised in hosting and internet solutions. He is a very proficient programmer in C/C++ and python, with extensive experience in open source and multi platform software: microsoft© windows™, unix/linux, apple© os x™. He contributed to several open source projects, such as PHP (php/fi) in 1996. Occasionally he lectures as invited professor at the Blanquerna/Ramon Llull University in Barcelona.

Software Factory Ltd

Responsible for tailoring the standard application

Software Factory Ltd is a 100% Fijian-owned company located in Suva. Their main product is a Loan Management System currently being utilised by several Pacific countries. Therefore the Pacific is the traditional market for the company, which makes them the ideal candidates to tailor the application and offer support to the Pacific RESCO/Power Utility that implement it. Since RESCO Manager will be released in open source and public domain, the RESCOs/Power Utilities will be free to decide who they want to contract to assist them, but it is important that at least a company in the Pacific specialises in offering such services.

Herb Wade

Responsible for improving the technical module

Herb Wade, currently based in Thailand, is a renewable energy specialist focusing on rural energy development who has worked on the Pacific islands continuously since 1982. He has participated in the development of the Kiribati outer islands solar implementation since its beginning in 1984. He proposed the change from a sales model to a RESCO model in 1989, was a member of the JICA team that implemented the 1992 pilot RESCO project and managed the EU PV-Follow up project that provided the expansion of the Kiribati RESCO project to three islands in 1994. He has provided input and advice for business and technical development to the Kiribati Solar Energy Company, Ltd. continuously since its inception. His task will be to improve the technical design, monitoring, troubleshooting and repair modules and check that the software addresses all technical, logistic and general business areas that are the responsibility of the KSEC, Ltd.

Peter Konings

Responsible for implementing it in FSM

Peter is a consultant specialising in renewable energy. He is currently one of the REP-5 team members, working as country manager for FSM. He has over 12 years of experience in Solar Energy and worked and lived for 8 years in Indonesia. He is co-author of the "Solar Entrepreneurs Handbook"; developed the successful "WARLISTA" ("Warung Listrikt Tenaga Surya" or "Solar Energy Shop") concept that opened opportunities for people in the rural areas to start their RESCO on a semi-franchise basis. He opened more than 23 RESCO's (Solar Energy Sales and Service Centres) in early 2000 in Indonesia, together with the Indonesian Company MEI (Mambruk Energy International) Currently he lives with

his family in FSM and besides the REP-5 programme he also advised the FSM National Government on energy matters.

6. Funding requirements

Refer to ANNEX 1, 2, 3 and 4

7. Terms of reference for activities to be funded by UNDP

Refer to the Terms of Reference attached in ANNEX 1,2 and 3

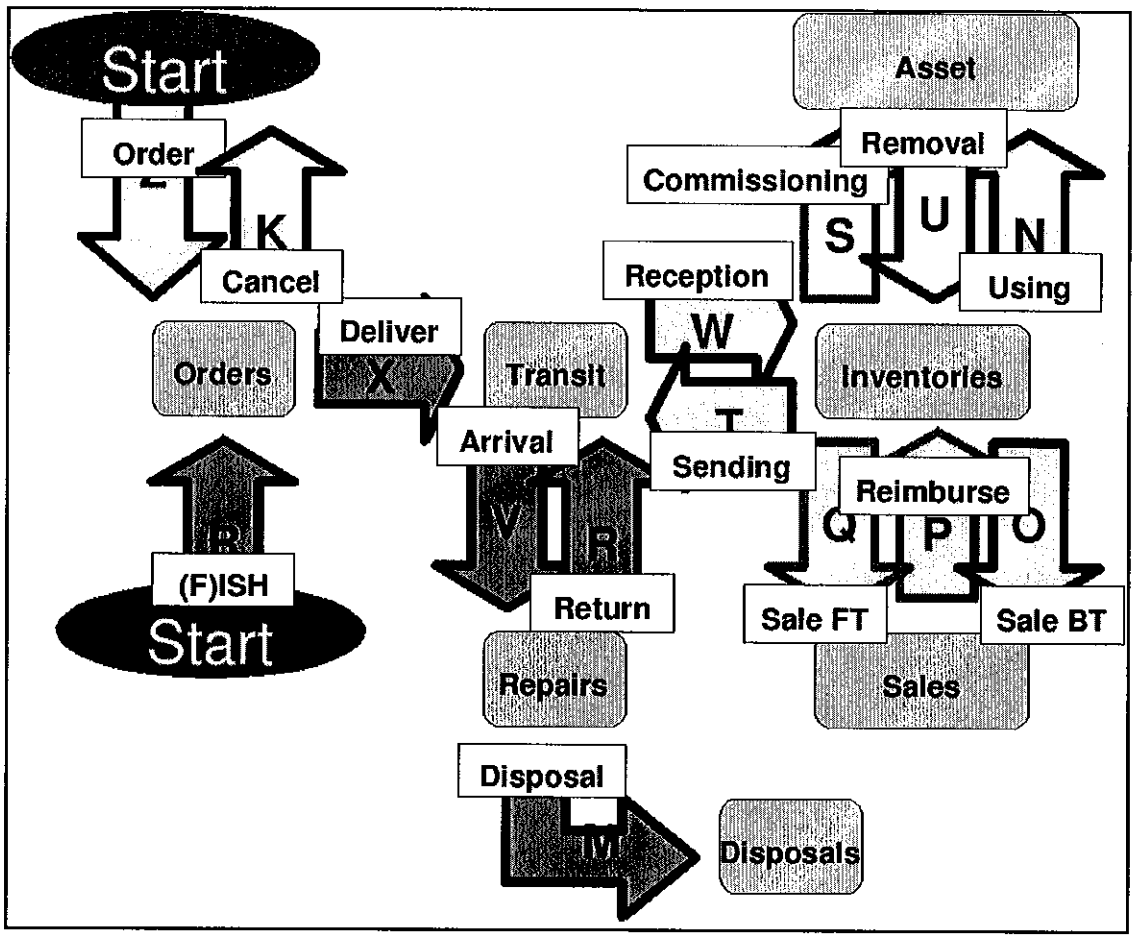
7.1. Designing the logistics module

The logistics module will define two types of items.

- *Fully traceable items*: are items individually tracked until they are properly disposed (e.g. batteries), even when sold to a client. In this way it will be very easy to implement schemes such as the *battery recycling scheme* already implemented in Kiribati or the one that UNDP is funding for Kosrae.
- *Non-traceable items*: They are tracked in lots until sold or locally disposed. Therefore they constitute items that do not present a hazard to the environment or local population (e.g. a bulb).

Traceability of individual items or lots will take place among the following eight types of locations:

1. **Orders:** Items ordered that are waiting to be delivered,
2. **Transit**: Items on transit to or from the outer islands (zones).
3. **Inventories:** Items stored in an outer island warehouse. These items can be either (1) sold, (2) used as spare parts, (3) incorporated as assets, (4) waiting to be sent to the headquarters for disposal.
4. **Assets:** Items incorporated as assets in a RE system. It will give information on the RE system where the item is installed.
5. **Repairs:** It is at the headquarters awaiting to be repaired (e.g old batteries).
6. **Sales:** These are items sold to customers.
7. **Disposed:** it stores data on all the lots of fully traceable items that were disposed. Lots in this location will be compiled in containers sent overseas for proper disposal.
8. **Adjustments**: it stores information on any adjustments done when carrying out an inventory reconciliation.



7.2. Improving the technical module

1. First it will be necessary to define:
   - a set of variables that can be monitored,
   - under what conditions makes sense to monitor them: for example, specific gravity is not monitored in sealed batteries,
   - the number of entries that each variable requires: for example, in a non-sealed battery the number of cells to monitor depends on the voltage, and
   - how the variables are related.

   In this way the RESCOs will be able to choose from all the available variables, relate them to specific system configurations, and decide the frequency they wish them to be monitored. For each possible variable to monitor, an explanation will be given on why it is important to monitor it and a suggested frequency in order to assist theRESCO to decide the variables to monitor and the frequency.
2. For all the variables that RESCO Manager monitors, a set of the ranges or correlations that trigger the alarms will be defined. An example of a range would be: when specific gravity is above 1.24, an alarm is activated. But more interesting than the ranges are the alarms based on correlations. For example, if the weather on that day and the day before was fine and voltage is too low, then an alarm is triggered.
3. Then, for each alarm an explanation will be given on what it means and what needs to be done when the alarm is activated. This will allow the field technician to click on the alarm

and follow the procedure set by it. The procedure will define a logical path that allows the technician and software to prepare a diagnosis. This means asking questions and depending on the reply, taking one path or the other, and suggest corrective actions during the process. For example, if the weather on that day and the day before was fine and voltage is too low, then it will ask if there is any object shading the panel, If the answer is no, the application will ask a second question, and so on until the problem is solved.

4. Together with the improvements in monitoring (*variables*) and preventive maintenance (*alarms*), the current menu for troubleshooting and repairs will be made more efficient. This necessitates the improvement of the current list of all the types of repairs that could be performed, plus the provision of explanations for each type of repair. Repairs need to be standardised in order to link monitoring data with problems experienced by the equipment. This will allow the central database to improve preventive maintenance and avoid a lot of problems before they actually happen.

Once all this documentation is prepared, it will be programmed into the application in a way that makes it very easy for the field technician to (1) enter monitoring data, (2) check the alarms that are activated as a result of the data entered or obtained from other sources (e.g. a weather station), (3) based on the alarms, suggest a set of activities to be carried out for preventive maintenance (e.g. check if panels are shaded), (4) if the equipment fails, suggest a logical path to define the diagnosis and solve the problem, (5) record all data in order to increase knowledge on performance of different components. This knowledge will not only help to improve accuracy of alarms and future diagnosis during troubleshooting, but provide variable information to RESCOs on the components that perform better under certain conditions (climate, etc.).

7.3. Improving the financial module

As a result of not providing internet connection from the outer islands, the current RESCO Manager is not flexible enough. Something we have learned from the experience of installing 2,100 solar home systems in over 100 villages and in 18 islands of the Gilbert group is that the way the fee is collected can vary and the application needs to allow for such variations. For example, in a well organised village, fee collection could be a community responsibility, similar to the way contributions to build a church are collected, while in another village the island technician will need to visit all the houses and individually collect it. On the other hand, some customers would prefer to transfer the money directly to the headquarters or to have a relative paying it from the capital, while some others will wait for a technician from the village or island to come before paying any money. The new RESCO Manager will allot for all these different ways of collecting the fee, and will offer solutions to avoid current problems such as island technicians not giving receipts to the customers and keeping the fees for themselves, information being transferred to the headquarters with a two week delay, island technician and headquarters not agreeing on the total amount of outstanding arrears, etc.

7.4. Implementing technical module it in Kiribati

This task involves:

1. Technical assistance provided to KSEC Ltd
   - Training on the technical module to headquarters personnel
   - Refreshing training on technical maintenance to headquarters personnel
   - Draft report and circulate for comments
   - Finalise report and submit to UNDP

2. Training programme for island technicians trialled in Abaiang through a training workshop
   - Conduct training workshop on the technical module and refreshing technical training to island technicians and village technicians
   - Draft report and circulate for comments
   - Finalise report and submit to UNDP

7.5. Technical Follow-up

This activity involves the following:

1. Impact of trial training programme monitored over 3-month period
   - Document findings and recommend areas for improvement
   - Circulate draft monitoring and evaluation report for comments
   - Finalize monitoring and evaluation report and submit to UNDP

2. Training programme for island technicians reviewed through stakeholder workshop
   - Conduct review workshop on the use of RESCO Manager for technical monitoring of PV Systems

3. Training programme for island technicians revised
   - Consolidate comments from review workshop and revise training programme as required
   - Circulate revised training programme for comments
   - Finalize revised training programme and submit to UNDP

7.6. Resource mobilization strategy

This activity involves the following:

1. Project benefits advocated through media
   - Finalize press releases
   - Raise profile through Internet and specialised press
   - Document best practices

2. Resource mobilization strategy finalized
   - Obtain list of communities to replicate best practices
   - Finalize regional resource mobilization strategy and submit to UNDP

3. Replication of best practices included in donor roundtable discussions
   - Confirm inclusion of topic in roundtable agenda
   - Organize agenda, confirm participants and venue
   - Promote best practices through resource mobilization strategy
   - Document outcomes and way forward

ANNEX II. TOWARDS A PACIFIC STRATEGY FOR RURAL ELECTRIFICATION

The RESCO Manager team believes that to successfully implement a project in rural electrification depends on three factors:

1. Choosing the right institutional structure,
2. Providing suitable IT tools for the financial, technical and logistics management of the equipment,
3. Expanding the rural electrification by following the right sequence,

1. Choosing the right institutional structure

In the Pacific, Governments have provided rural electrification to remote locations by means of four main institutional set-ups, which are:

1. Engaging the power utility in carrying out the rural electrification. This is the approach followed in RMI by the Marshall Electric Company (MEC) or in the Federated States of Micronesia by the Yap State Public Service Corporation (YSPSC) and the Chuuk Power Utility Corporation (CPUC).
2. Setting up a different entity for the rural electrification (RESCO), but still centralising much of the decision making process in Government officials through the nomination of a board of directors. This is the strategy applied in Kiribati, with the Kiribati Solar Energy Company Ltd (KSEC).
3. Decentralising operation and maintenance by engaging the private sector, while keeping the ownership of the equipment in the hands of a government department. This is the solution followed in Fiji with the RESCO charter and in Pohnpei State (Federated States of Micronesia).
4. Decentralising operation and maintenance by engaging the users, and transferring ownership of the equipment to the organisation that represents them. This is the solution followed in Tonga though the *Ha'apai District Solar Electricity Committee.*

The only element these strategies have in common is that the equipment is not owned by the users. This is known as the RESCO model, a model that has had great success in the expansion of rural electrification in the Pacific and worldwide because:

- Low income rural households receive electricity without having to invest in renewable energy equipment, something that they would not normally be able to afford due to the high cost of the required equipment.
- Equipment is properly maintained and components replaced by the RESCO, making sure that the service is not interrupted,
- Equipment is owned by an organisation that directly or indirectly represents the users (beneficiaries of the funding). This can be (a) a Government incorporated organisation (Kiribati, FSM or RMI), (b) a Government department (Fiji, FSM) or (c) an organisation directly representing users (Tonga).

As a result of all this, donors are prepared to contribute with funding to the RESCO concept because it makes their aid (1) effective, (2) sustainable and (3) accountable.

Does an ideal structure common for all exist?

We believe that an ideal structure common for all does not exist because each country is different. On top of this, the success or failure of any structure depends more on the individuals that were involved in implementing it and those ones that run it more than on the structure itself. That is, it depends more on the ability of the structure to engage the right people and skills, than on the organizational set-up. Therefore it is not possible to say that because a structure worked in the

past, it will continue working in the future or it can be replicated in another place with the same level of success.

Nevertheless, this does not mean that there is not a definition of ideal structure. We believe that the optimal institutional structure for each given location (country/state,...) is one that:

- according to the local culture and context,
- is able to involve:
- the right stakeholder in every decision, and
- the right skills in every action,
- in order to offer a service that is:
- of good quality
- affordable, and
- sustainable

Involving the right stakeholders in every decision:

A way to test if a given structure is involving the right stakeholders in every decision is by analysing who decides the monthly fees to be charged in exchange of the electricity services and if these fees are affordable and sustainable. According to the given definition, the **monthly fee** should be decided by the stakeholder that will set it at the intersecting point between both affordable and sustainable.

1. **Affordable** means that low income families will be able to pay it without undergoing any financial hardship. A good way to see if a fee is affordable is to compare it with what the family would spend on energy if they didn't have electricity. For example, the monthly kerosene consumption for lighting or the cost of dry cells for the radio. In the Pacific, these costs are typically in the order of US$20 to US$30 month.
2. **Sustainable** means that it is sufficient for recovering the operational and capital costs.

But the reality is that all too often the monthly fee is a political decision, and as a result it is set too low, that is, at a level not sufficient to recover the operational and capital costs.

a. Operational costs will depend on:

1. How **centralised** the structure is: the more centralised it is, the higher the indirect operational costs (operational costs incurred by the centralised body).
2. How much the structure relies on **money as a means of exchange**: for example, if local technicians are employed in exchange of a wage, direct operational costs will be higher. But if the structure relies on non-monetary means of exchange (barter), by providing skills or things to the technicians in exchange of their service, then direct operational costs will be lower. The same can be said for sitting allowance paid to the members of the committees that meet to decide matters related to the service, etc.
3. How **complex** the structure is: the more people involved, and the more complex the decision making process, the higher the operational costs in general, both direct and indirect.

b. Capital costs will depend on:

1. How **centralised** the structure is: the more centralised it is, the higher the indirect capital costs (capital costs incurred by the centralised body).
2. How the equipment is **funded**: If the initial equipment is donated, the main direct capital cost is the replacement of parts and components. If initial equipment is not donated, then the fee will need to provide not just for the replacement of parts and components but for the initial investment as well.

Involving the right skills in every action:

According to the given definition, the decision on who to engage should be made by the stakeholder that is able to engage the right skills. This would be the stakeholder that hires the right person for every job, without political favoritism or personal motive.

As guideline it would be good to start by analysing who appoints the technicians that would be in direct contact with the user of the electricity service. Are they appointed by a committee of users, by a council, or by a centralised body from the capital? Are they currently performing as expected? Will the performance of the technician be evaluated and if yes, by whom and using what methodology? If the technician stops performing as expected, how will those who appointed him or her get to know about it? Once they know, are they willing to take action?

Answering these questions for everybody directly or indirectly involved in providing the service helps to evaluate if the institutional structure is able to hire the rights skills.

2. Providing the right IT tools for supervising remote systems

We believe that the right IT tool is an internet based software application that enables the users to have online collaboration. Why?

The largest encyclopedia ever written on paper format is the Enciclopedia Espasa, an encyclopedia in Spanish language with 119 volumes and 200 million words. To write it took over 100 years.

The largest encyclopedia ever written on on-line format is Wikipedia, an encyclopedia with almost 2 billion words and over 10 million articles in 250 languages. The English edition alone has over 1 billion words, 5 times more than the Enciclopedia Espasa. To write it took 7 years, and it is expanding at an amazing pace.

What made Wikipedia possible? The answer is **online collaboration,** this is **internet + an IT tool.** The tool is based on the concept of *wikis*, it is web based, open source and public domain. This proves that with the right IT tool and the internet, it is possible to do what just a few years ago was unthinkable.

Therefore, the second element that would greatly assist in expanding rural electrification in isolated areas in the Pacific, and thus contribute to the effectiveness of the aid that goes towards this purpose, is a software application able to assist in:

- selecting the right equipment for each location,
- coordinating the installation of large numbers of units,
- managing the financial, technical and logistics aspects of providing the service

The tool should be user friendly, flexible, effective and on public domain.

- **User friendly** means that it should be relatively easy to understand and run.
- **Flexible** means that it should be able to fit in any given institutional structure, allow for exceptions, and even help to implement modifications to a given structure by just changing the rights and levels of access of a defined group.
- **Effective** means that it should be useful to effectively manage a rural electrification project and assist the organisation responsible for the operation and maintenance of the equipment by providing the best possible service at the lowest cost.
- **Public domain and open source** means that nobody can claim ownership of the code, but should be created for the good of all,

The RESCO Manager project aims at creating such a tool, a tool that is:

4. **Web based**: which makes it user friendly, flexible and effective.
5. Programmed in **python language**: which is an open source standard for web based applications.

In 2001 work began on the design of the tool, as part of the EU funded project "Solar Energy for the Outer Islands" and it was first implemented at the Kiribati Solar Energy Company (KSEC) in

2005. Then, in July 2007 a second phase began with the aim of **creating a web based application that could become an open source standard for managing the technical, financial and logistics aspects of renewable energy service companies (RESCOs).** The software application is called RESCO Manager and it is currently under development.

3. Electrifying rural locations by following the right sequence

The third element that according to the RESCO Manager team maximises the chances of successfully implementing a project in rural electrification is the sequence. RESCO Manager aims at becoming a standard for RESCOs, that is, a software application that can fit in any given institutional structure and facilitate its implementation. With this idea in mind, the application is being designed so that different roles and rights will be assigned to different groups of people according to the chosen institutional structure. In this way communication, coordination and efficiency will be greatly facilitated.

Nevertheless, although RESCO Manager is flexible enough to fit in any institutional structure and even facilitate its implementation, there are three requirements to successfully implement the software and the need to fulfil them constitutes an optimal sequence of steps for rural electrification.

The three requirements are:

- **Communication:** Internet connectivity for data transfer or what is called RICS (Rural Internet Communication Services).
- **Hardware:** laptop computers for consulting and modifying data.
- **Training:** users of the rural electrification services properly trained on the use of the application and related tools (hardware, communication, etc.)

The logical sequence of steps that maximises the chances to fulfil the requirements is:

- **Electrify rural schools first or build community centers** and provide them with internet connectivity. This approach was implemented by the People First Network in the Solomon Islands (http://www.peoplefirst.net.sb). The project came to prove that it is possible and economically feasible to set up distant learning centers in the outer islands and provide them with reliable internet access. The cost of setting up a V-SAT connexion is around US$ 3,000, plus US$195 for the lowest bandwidth, which is more than sufficient to run the software application.
- **Distribute low cost computers to all people involved with the service.** A very good alternative is a One Laptop Per Child computer (OLPC). OLPCs are a potent learning tool created expressly for children in developing countries. They are flexible, ultra-low-cost (US$100 per unit), power-efficient (12 W consumption), responsive, and durable (build to last 5 years in the hands of a child). This is why RESCO Manager is been programmed not only to run on an OLPC, but it is been programmed using the *python programming language* (http://www.python.org), the same language used by an OLPC to programme its user interface called SUGAR. For more information on how RESCO Manager is involved on the OLPC project, see http://wiki.laptop.org/go/Projects/RescoManager)
- **Ensure that along with the computers, all the required tools for learning and managing a RESCO are provided.** The tools for learning are interactive multimedia applications, while the tool for managing a RESCO is RESCO Manager.
- **Once there are people in the rural areas familiarised with the computers, the internet, the renewable energy technology, and the IT tools for managing RESCOs, it is the right time to expand the service.** The pilot project that brought electricity, internet and laptops to the community constitutes the beginnings of a RESCO, and with the expansion of the services, the RESCO reaches maturity, with the ability to provide electricity to large numbers of customers (e.g. *schools, households, health centers, community halls, small businesses, religious centers, etc.*).