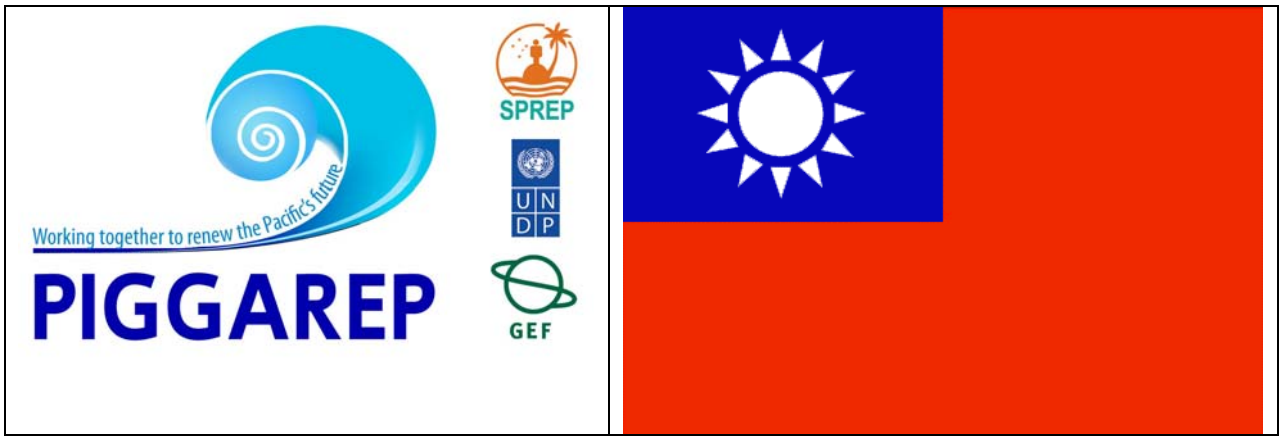


Report on the Small Islands States Capacity Building Workshop on Renewable Energy Technology Applications

Port Vila, Vanuatu
21st - 25th April 2008

1. Background

Climate change has been recognized by Pacific Forum Leaders as one of the most serious threats to the region. The Pacific islands have already experienced, and will continue to experience the adverse effects of climate change and these are expected to worsen over the coming decades. For some low lying atoll countries, climate change may even threaten their very existence, as confirmed by the recently published Intergovernmental Panel on Climate Change (IPCC) report, AR4.

In 2006, the Secretariat of the Pacific Regional Environment Programme (SPREP) submitted a project proposal to the Taiwan/Republic Of China Regional Development Assistance 2006/2007 for a *Small Island States Sustainable Solar Initiative (SI3SI).*

The purpose of the SI3SI is to improve solar electricity project management skills in the Small Island States (SIS) and to disseminate experiences gained from the rehabilitation of the Namdrik solar electrification project in the Marshall Islands.

The objective is to improve the standard of living in the outer atolls and rural areas in the SIS through the delivery of high quality, customer-oriented solar electricity services. This was to be achieved through:

- hands-on management and technical training on the Namdrik Solar Rehabilitation Project at RMI for two solar electrification project managers each from Kiribati, RMI, Palau and Tuvalu; and

- production of a TV documentary to highlight and disseminate the experiences from the Namdrik Solar Rehabilitation Project.

At the Sixteenth SIS Leaders' Summit held at Nuku'alofa, Tonga on 15 October 2007, the Summit noted that non-fossil solutions are viable and critical, particularly for the SIS, which face particular hardships as a result of climate change and sea level rise. SIS Leaders requested the support of development partners to improve the Pacific's access to and affordability of such non-fossil technology, including through the coordination of efforts at national level.

It is estimated that for every $10 increase in the price of oil, national incomes for the Federated States of Micronesia and Kiribati reduce by over 4% and by at least 2% in Tonga, Tuvalu, Palau and the Solomon Islands. A meeting of Pacific Energy Ministers held in Rarotonga, Cook Islands, 25-26 April 2007 noted that biofuels of a recognized quality standard could make an important contribution to greenhouse gas (GHG) mitigation and to energy security and sustainable energy supply. It noted that local biofuel production should be evaluated and progressed where it is economically viable and environmentally sustainable.

Prior to the SIS Leaders' Summit, the Global Environment Facility (GEF) approved the funding of the Pacific Islands Greenhouse Gas Abatement through Renewable Energy

Project (PIGGAREP), with the United Nations Development Programme (UNDP) as the Principal Project Representative and SPREP as the Implementing Partner. The PIGGAREP is to assist eleven (11) PICs, including SIS, with their GHG mitigation effort through the removal of barriers to their renewable energy developments and encouraging the productive utilisation of renewable energy (PURE).

The implementation of the PIGGAREP commenced in July 2007. PICs such as Kiribati, Tuvalu, Tonga, Solomon Islands and PNG have included in their PIGGAREP work plans exposure visits to renewable energy developments and project sites in other PICs. PIGGAREP is also participating in a SPREP-British High Commission Climate Change Film Project (CCFP) which will train and support media professionals, filmmakers and producers from Fiji, Kiribati, Samoa, Tonga, Tuvalu and Vanuatu to research, develop and produce their own short film on how climate change is affecting their country. Their stories will not only highlight the effects of climate change, but also share the inspirational stories about what is being done to reduce its impact, including renewable energy and its productive utilisation.

Given the PICs requests for exposure visits support from the PIGGAREP and some of the PICs in the PIGGAREP are also in the SI3SI, it was decided that a collaborative effort between PIGGAREP, SI3SI and the CCFP in the form of a regional workshop focusing on the SIS be conducted.

The focus of the planned SI3SI workshop was then broadened from the Namdrik solar photovoltaic project to include other technologies and resources such as grid-connected PV, solar water pumping, wind, biofuel and biogas. Hydropower, though not appropriate for SIS, was included for the benefits of the participants from PNG, Solomon Is and Vanuatu. Vanuatu was chosen as the workshop venue because of its experiences with most of the technologies and resources and because of its accessibility to the interested PICs. To address both SI3SI and PIGGAREP interests, the workshop was called a SIS Capacity Building Workshop on Renewable Energy Technology Applications and the date was set to be the 21st – 25th April 2008.

2. Workshop Objectives

The objectives of the workshop were to:

- To strengthen the capacity in the SIS to Productively Utilize Renewable Energy (PURE) services from standalone and grid-connected PV, wind and biofuel through the sharing of RE experiences, and

- To enable SIS to observe and to learn from the biofuel and wind power developments as well as the RE developments in Australia and other PICs

3. Workshop Methodology

The workshop was conducted through power point presentations by the participants and resource personnel and followed by questions and discussions.

No special papers were prepared for the workshop. Instead, reports relating and relevant to renewable energy in the SIS were collected and form part of the contents of the workshop CD. These reports include the following:

- Feasibility of grid-connected wind power for Rarotonga, Cook Is
- Power Sector studies in the atolls of Atiu, Mauke, Mitiaro and Pukapuka in the Cook Islands
- An Evaluation of biofuel projects in Taveuni and Vanua Balavu, Fiji
- The Teachers Solar Light Project in PNG
- Tuvalu grid-connected PV feasibility study
- Tuvalu Base Tariff study report
- Disaster and Renewable Energy

The workshop programme was arranged by technology and resources, with some site visits and tours in-between, as follows:

- Stand alone solar home systems and general RE project managements experiences
- Grid-connected PV
- Biogas
- Tour of PV, biogas and gasifier projects
- Biofuel
- Tour of the UNELCO biofuel for power and transport sites
- Wind
- Tour of the UNELCO wind power installations
- Hydro

The workshop was honoured by the presence of the former Prime Minister and current Minister for Lands and Natural Resources of Vanuatu, The Hon. Maxime Carlot Korman, to officially open the workshop. The opening speech is attached as **Annex 1**.

With regards to the production of a TV documentary, SPREP has engaged the services of Mr Johnety Jerety, a local consultant in Vanuatu to do some filming during the workshop week, interview participants and film the project sites visited by the workshop. SPREP has committed US$11,000 from the Taiwan funds for the completion of the TV documentary.

4. Workshop Participants

Invitation for the expression of interests to participate in the workshop was sent to the PICs. The final selection of participants was however reserved with the PIGGAREP PM. This was to ensure that the workshop will get the most appropriate participants who

would share their experiences and would, upon their return, most likely put to productive practice the things they learn in the workshop. It was also to enable a balanced mix of participants.

A total of 27 people participated in the workshop. An analysis of the participants revealed the following:

- 10 or 37% were senior officials from Power Utilities. Of these 10, 6 or 60% are General Managers of Power Utilities
- 2 or 7% were NGOs
- 2 or 7% were power developers / investors
- 6 or 22% were from Government Energy Offices. Of this 6, 4 or 67% were from Vanuatu alone
- 3 or 11% were from the private sector as consultancy firms and/or renewable energy equipment supplier
- 1 or 4% was from a copra oil mill
- 1 or 4% was a villager / resource owner
- 2 or 7% were from inter-governmental organisations
- only 2 or 7% were women
- 13 or 48% were engineers
- 4 or 15% are private sector who are either selling renewable energy equipments and/or directly involved in the installations of renewable energy systems on the ground.

The participants' list is attached as **Annex 2**.

5. Workshop Presentations

As a key criterion for being sponsored to participate in the workshop, participants were requested to submit their presentations to the PIGGAREP project manager first prior to the confirmation of their travel authorization.

The following pages are the presentations that were delivered at the workshop:

Introduction, stand-alone solar home systems and general RE project management experiences

SIS Capacity Building Workshop on Renewable Energy Technology Applications

Melanesian Hotel, Port Vila, Vanuatu
21st - 25th April 2008

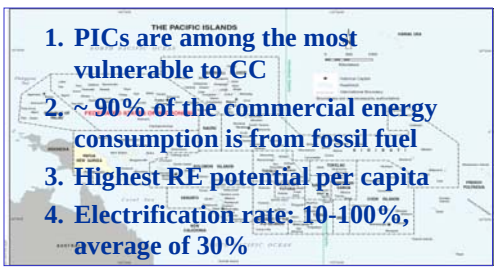
Solomone Fifita, Manager - PIGGAREP, SPREP, Apia
(solomonef@sprep.org)

Introduction

and

Setting the Scene

The PIC Paradox



1. PICs are among the most vulnerable to CC
2. ~ 90% of the commercial energy consumption is from fossil fuel
3. Highest RE potential per capita
4. Electrification rate: 10-100%, average of 30%

The PIC Goals

Reduce dependence on fossil fuel

Improve Resilience

Contribute to the global GHG reduction effort

Utilize more RE

Reliable and cost-effective electricity to all

Many high level meetings, workshops, etc

Stock take questions

1. Where are we?
2. Is RE really green?
3. What works and what does not work?
4. What can we do to move the RE agenda forward?

Where

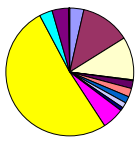
are

We?

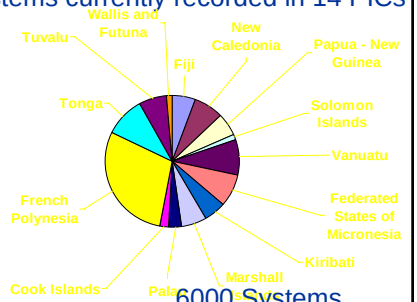
Stand alone solar PV systems

1. About US$20 million from 2000 - 2010
2. Almost 20 years of experience
3. Mostly in the rural / remote areas
4. People are demanding more
5. Willing to pay more?

PV systems currently recorded in 14 PICs



1.8 MWp Installed Capacity



6000 Systems

20 years on …….

Working!

What?

Who cares?

My toy!

Solar water heaters

1. Very common with new houses
2. It works both as RE and EE
3. Subsidized by REP-5 in Niue
4. Aid-funded ones are neglected
5. More promotion

Mixed success with local manufacture

Still the one!

Grid-connected PV

1. About US$10 million from 2000 - 2010
2. Fairly new and a lot of interests
3. FEA at Navutu (1997), Apolima in Samoa People (2006) & Tuvalu (2007)
4. About USD 10,000 / kW vs. USD 1,000 for diesel generators
5. REP-5 installations at Nauru, Niue & FSM
6. More from EDF 10 and the Italian

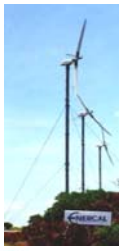
Wind Power

1. About US$20 million from 2000 - 2010
2. No convincing success stories outside the French Territories
3. Power utilities are involved, e.g, FEA
4. More are in the pipeline / under consideration
5. There is hope …

Large Wind generators in PICs

- One 5 MW wind farm in New Caledonia
- Estimated 15 islands in PICS suitable for "large" grid connected wind farm implementation.
- Always need detailed feasibility study (site specific)

Medium size Wind plants in PICs



- A few 20 - 200 kW wind farm in French territories and Fiji
- Plenty of small islands suitable for medium size grid connected or "hybrid" wind farms.
- In small islands cost of classic fuel based kWh usually high
- needs detailed feasibility study

Real Experiences

Once upon a time at Nabouwalu and Mangaia!

Firewood

1. Can't do without
2. Rural / remote area fuel
3. Problem with coral atolls?
4. Declining supply vs. Demand for more convenient fuel

Real Experiences

Shortage?

How many more new designs?

Still the fastest way!

Biogas

1. Alofa Tuvalu in Tuvalu
2. 10 is proposed in Fiji for the Italians
3. Some in Vanuatu
4. Does it work?
5. Very common in Asia
6. Can earn CDM benefits
7. Bundling household level pig farms

Biogas at Motufoua, Tuvalu

Biofuel

1. RMI & Vanuatu
2. Proposed by Samoa for the Italians
3. Does it work?
4. Is it economical?
5. Can it compete with the cosmetic industry?
6. Can it be sustained without affecting food supply?

Hydro power

Well advanced

Geothermal

PNG is taking the lead

Manpower

- Reduce fossil fuel use
- Improve health

Cycling

Walking

Sweeping

Is RE really Green?

1. If it works then it is green
2. If communities are better off economically, socially and environmentally
3. If it improves social infrastructures and services
4. If it creates jobs and produce value added products
5. Productive Utilisation of RE (PURE)

What works and What doesn't?

1. Let us share our experiences.
2. What were the baselines, the BAU, etc
3. What was the RE intervention?
4. What is the background to the intervention?
5. How was it delivered?
6. Who delivered it?
7. What are the impacts?

What can we do to move

the RE agenda forward?

1. Leadership
2. Vehicle
3. Business

Leadership

True Champions

Look beyond one's stomach and pocket!

Vehicle

- Micro-financing
- Community development projects
- Youth development activities

Business

- Innovative ways of doing business
- Readily adapt to the changing circumstances

RE Opportunities for the SIS

1. REP-5
2. EDF 10
3. PIGGAREP
4. Italian

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1. REP-5
2. EDF 10
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RE Opportunities for the SIS

1. REP-5
2. EDF 10
3. PIGGAREP
4. Italian

Let's share experiences

1. Say the positives
2. Say the negatives
3. Let's be constructive

Village level telecommunication project

Village level water pumping project

Village level income-generation project

Village level income-generation project

Village level health project

Village level school project

Empowering local communities

Small local businesses

Jobs

Workshop Outcome

Definite course of future actions for PIGGAREP to take up with other agencies, donors and parallel RE projects in the region

The End

Thank You

Evolution of KSECL from Failure to Success

Start as Retail and Wholesale Company:
- 1984 founded as a solar sales company. USAID funded.
- 1989 KSEC LTD is bankrupt.

Changed into a Renewable based Energy Service Utility Company.
- 1990 -Reorganized into a "solar utility" RESCO with users paying a fixed monthly fee for services and all maintenance carried out by the KSEC LTD.
- 1992 - JICA funds initial RESCO pilot project on North Tarawa. 55 installations.
- 1994 - EU funds expansion to 250 installations on three islands
- 2004 - EU funds expansion to over 1,700+ installations on 18 islands
- 2006 - EU evaluation team provides high marks for the project and negotiations begin for future expansion of services
- 2007 Anticipate major expansion to be implemented under EDF10 in 2009

Republic of KIRIBATI

- **Geography**: **33** low lying Atolls except Banaba; Three main Groups (**18** in Kiribati Group, **4** in Line Group and **11** in the Phoenix Group; Pacific Ocean/Straddle Equator and International Date Line. West to East – **4,200**km; North to South – **2,000**km; Land mass – **811** km^2
- **Population**: **92,533** (83,683 live in Kiribati Group, **8,850** live in Line and Phoenix Group)
- **Capital Island**: **40,311** people live in Tarawa
- Total Number of Households: **13,999** (**8,052** located in the outer islands.
- Total number of Households electrified in the outer islands is **2,734**.

Main Reasons for failure 1984 - 1989

The retail concept failed. The reasons were:

- Solar Home Systems were not installed properly
- Solar Home Systems once installed were not properly and regularly maintained
- Many system owners had replaced the original high efficiency fluorescent lights with automobile head lights or tail lights when the fluorescent bulbs failed
- As a results of the failures, the customers loose interest in buying PV systems
- sales drop dramaticallyin1989 causing the company to be bankrupt.

KSEC LTD New Objectives based on RESCO concept

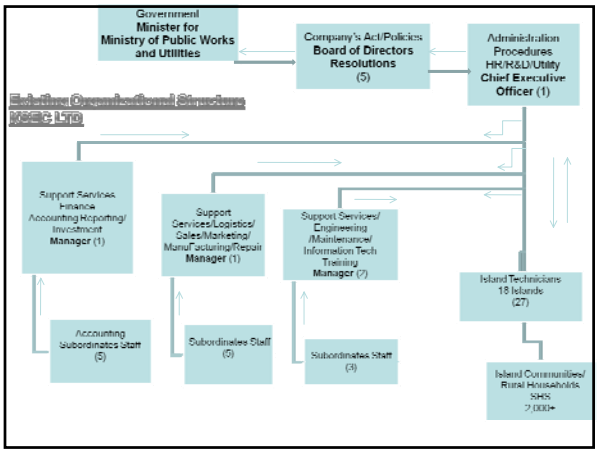
- To provide reliable solar electricity for lights and radios to outer island households at an affordable cost yet at a fee that makes the project fully sustainable for maintenance.
- To support public solar projects (water pumping, health centres, schools, communications, street lighting etc.) through system design, procurement, installation and maintenance
- To develop a technical maintenance structure for the outer islands that can support other technologies.
- To develop a technical manufacturing capacity in Kiribati for the assembly of small electronic devices (solar controllers, lights, DC/DC converters).

JICA & Launching of RESCO Utility 1992

- Utility service oriented concept implemented in North Tarawa (closest rural atoll) with installation of 54 SHS and 1 Community hall
- KSEC LTD owns and maintain power supply components (PV modules, controller, battery and cables.
- User owns the light and switch plus cable connecting the light to the switch.
- Users pay A$50 connection fee and charged a fixed monthly fee of A$9.
- 1994 project evaluated revealing successful results. (SHS were operational and users paid on time)

RESCO (Solar Utility)Components

- A SHS funded by JICA IN 1992 and EC in 1994 consist of the following components:
  - A marine grade galvanised pole or Fiji Pine timber pole and mounting racks,
  - 100Wp PV module,
  - 2 x 7W solagen Efficient Lamps,
  - 1 x 11W solagen Efficient Lamp,
  - 1 x 100Ah lead – acid solar battery,
  - 1 x 10A Electronic Controller,
  - 3 x Switches and;
  - 30 meter long Cable (10 x 4mm sq. and 20 x 2.5mm sq.)
  - DC/DC converter for radio and CD player



EDF expanded Pilot Project 1994

- Lome II regional Follow UP programme launched in 1994. Kiribati received 250 SHS.
- 100 SHS installed in North Tarawa (initial pilot site) to meet high demand
- 75 SHS installed in Marakei Atoll (60km North of Tarawa)
- 75 SHS installed in Nonouti Atoll (100 km South of Tarawa)
- Project evaluated in 1998 and it was successful (SHS were operational & users paid on time)
- High demand for SHS on waiting list

EDF8 Major Utility expansion 2004

- 1700 SHS and 96 Solar Lighting for Community Halls were installed in 18 Atolls in the Kiribati Group
- North Tarawa, Marakei and Nonouti almost fully electrified with solar (80%,90% and 70% respectively). The remaining 15 Atolls received average number of 75 SHS each.
- Overall total number of SHS is 2,005 plus 97 Solar Community Halls.
- Connection fee remains and utility monthly fee remain unchanged – A$50 and A$9 respectively
- Estimated 29% of rural households connected to Solar Utility

EDF8 HR Developments/Training 2001 - 2003

- User Training carried out by project staff on Utility policies and how to use and look after the SHS. This training was carried out prior installation of SHS
- Senior Technicians trained on PV Technology, Technical Design, Installation, Maintenance, Trouble Shooting, Administrative and Technical Procedures, RESCO Manager.
- Employees of the Manufacturing Departments were trained in Manufacturing Process & Quality Control with assistance of TA and specialised consultants
- Training for Island Technicians in basic mathematics and electricity (equivalent to year 3 of Junior High School) as a prerequisite to their training in PV technology, system sizing, etc.

EDF8 Inception Phase 2001 -2003 (HR Developments/Training)

- Senior Managers of Company were involved in the in the Technical Design and Technical Specification of SHS, Preparation of tender dossier and Issuing of tenders, evaluation of tenders and preparation of supply contract etc.
- Logistics Department was set up and staff were trained in logistics and in particular the monitoring of every container from port of loading to their delivery in Tarawa. Every single item and quantity in each of the containers shipped were recorded and rechecked upon delivery into the warehouse and to their respective designated islands.
- Finance Manager and her staff were trained in an effective budget control of the project fund and report to CEO on a weekly basis.

EDF8 Inception Phase 2001 -2003 (HR Developments/Training)

- The senior management staff were trained by TA regarding the EU rules and regulations particularly in the formulation Annual Work Programmes (budgeting), Preparation of Addendums to formalise the approval of funds reallocation from budget line to another etc.
- Senior Management also received hands on training in business and project implementation and management to ensure that the project is smoothly advanced within the time line given.

EDF8 HR Developments/Training 2004 - 2007

- The Field Technicians receives hands on training in installation and logistics through out the installation period which took 6 months to complete.
- After commissioning the Technical & Administrative training was launched. The field technicians received training by Senior Technicians on how to do proper maintenance, fee collection and other important administrative, technical and accounting procedures required to ensure RESCO Manager provide an update and true reports on the status of Utility for each island.
- After commissioning a quality control check was carried out for every SHS installed to verify that the system is properly installed in accordance to the required standard. The logistics and Manufacturing Department staff were implementing this important task.

Procurement & Tendering

- Technical Specifications prepared by KSEC LTD with the assistance of TA
- Procurement of components was supplied through an International Tendering Process in accordance to EC rules.
- Suppliers bid in Lots as follows:

  Lot 1 – PV modules and racks, Lot 2 – battery, battery box and accessories, Lot 3 – Cables, switches accessories; Lot 4 – Lamps, Lot 4 Timber Poles; Lot 5 – Controller
- tender evaluation committee (KSEC LTD, MPWU and National Planning Office)

Problems encountered in tender process

- Non of the suppliers meet the required specifications for the supply of Controller components. Hence the tender for the controller would have to be carried out twice.
- PL tubes supplied for the lamps were of poor quality (manufactured in China). The supplier agreed to replace the tubes with the ones made in Europe.
- The battery caps provided has a hole that exposed the electrolyte to dust. The caps were not recommended and the transport caps were used. KSEC LTD field technicians were advised to clean the battery caps regularly.
- The PV module racks provided have holes that were not aligned with the holes in the PV modules. The supplier supplied a new drilling machine.

Outputs / Outcomes

- High reliability solar home system design (battery life 9+ years, very low failure rate for controllers and panels).
- 15 year demonstration of an institutional approach that has operated and maintained solar home installations with no subsidy other than the initial capital investment
- Development of management structures for large scale dispersed solar home system installation and maintenance

Current Status

- Over 2000 households on 18 outer islands reliably electrified by solar photovoltaics
- 80% on-time fee collection
- KSEC LTD is contracted to maintain public solar installations and as well as private solar home systems.
- Negotiating with donor for installation of Micro PV Grid Solar Systems in Boarding High Schools and remote communities outer islands.
- Negotiating with donors for grid connected solar on South Tarawa and mini PV grid systems on outer islands
- Negotiating with government for urgent need to increase the fee

Lessons Learned

- Customers who fail to pay fees must be promptly disconnected.
- A strong system of management and continuing training of personnel are essential to success in a RESCO.
- PV system designs and components need to be of the highest possible quality and fitted to the island environment to achieve maximum reliability and to minimize the cost of maintenance.
- It is practical for a local company in a small, technically undeveloped country like Kiribati to manufacture high reliability electronic equipment for solar PV.
- The selection of the Island Technician must involve members of the community
- Customer and employee Incentives have major impact in the reduction of arrears and delivery of improved services respectively

Challenges

Primary Challenge:

Getting government (who owns the KSEC LTD) to allow tariff increases commensurate with inflation. Tariff have been the same since 1992 and this is causing the present and estimated future cash flow to be insufficient to guarantee replacement of batteries at their time of failure. The tariff required in order to achieve a sustainable level is A$14/SHS/month.

Operation Costs is high. Management is aiming to reduce the number of supporting staff within headquarters and in the field (village technicians), control and minimize telecomunication and electri bills and improve the efficiency at all levels in the structure.

EDF10 Activities 2009 -2013

Expansion of SHS:
Install additional 1,500 SHS in the Kiribati Group

Electrification of Boarding High Schools on Outer Islands:
5 Senior Secondary Schools will be electrified with PV Solar, Service Center will be constructed in the school compound and equipped with internet facilities. The center will be provide renewable energy education to students and offices of KSEC LTD. This idea originated in the Solomon Islands.

KSEC LTD services will be expanded to the Line Group:
A service center in Kiritimati will be constructed and employees will be recruited. A mini PV grid system will be installed in Poland village in Kiritimati Island. The SC will pave the way for future expansion in the Line Group.

PV – Grid Connected System Pilot Study:
A PV – Grid connected system will be installed in the KSEC LTD headquarters located in South Tarawa.

Energy Efficiency in the Rural Area:
KSEC LTD will implement energy efficiency activities in the rural area while Energy Planning Unit will deal with urban South Tarawa.

KSEC LTD OTHER SUPPORT SERVICES

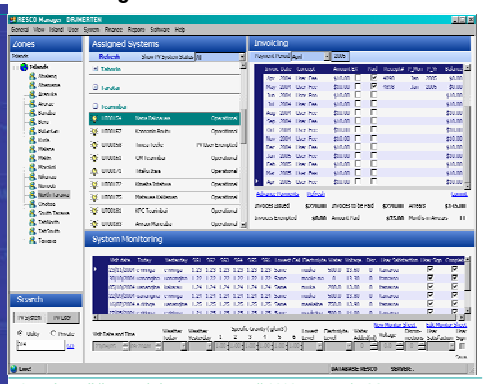
MAINTENANCE SERVICES:

Ministry of Health has benefitted from KSEC LTD maintenance services since 1992. Every year the ministry signed service contract with utility company and paid A$30,000.00 for the service. The maintenance is carried out by local field technicians with support from headquarters.

Similar contracts have been signed with government owned for their Solar Power Back up systems, Street Lighting, solar water pumps and lighting systems.

A few private owned solar lighting systems have benefitted from KSEC LTD maintenance service. The maintenance rate depends on the size of the solar PV system. It varies from A$5 - A$10 per month.

RESCO Manager



Community Hall (Maneaba)

Energy Efficient PL Lamp 12V, 11W

Battery Box & Pole mounting

Acknowledgements

The KSEC LTD would like to acknowledge the dedicated support, advice and invaluable assistance provided by:

- the 1992 JICA team,
- the 1994 EU team, the 2000 EU team
- SOPAC Energy Department Senior Officials and staff
- UNDP and PIGGAREP and in particular Solomone Fifita.
- Mr. Herb Wade who initially designed the RESCO structure of the KSEC in 1989, provided technical training for staff in 1989, 1992, 1994 and 2003 and initiated the local manufacture of high reliability controllers and DC/DC converters in 1993 and continues to provide invaluable technical and management advice when requested.
- Mr. Marc Torra and Soft Factory Limited who have been helping us with development of RESCO Manager, an Information Management Software that have enable us manage more than 2,000 SHS
- on outer islands.
- Ms. Saunoa for her effective and efficient assistance in arranging my travel bookings to participate in this important workshop.

- KAM RABWA (THANK YOU)

Development of Renewable Energy in the Cook Islands

Nooroa TUPA, Manager Generation,
TE APONGA UIRA O TUMU TE VAROAVRO

YESTERDAY (1970 – 1990) WHAT WE HAD

SOLAR ENERGY:

- **Solar Drying - Food drying - banana, copra, fish.**
- **Electric Fencing - Common for goat and pig farming.**
- **Water Heating - Household & Commercial.**
- **Navigational Lighting - for pilot lights.**
- **Battery Charging - for lighting, radio and telecommunication.**

WIND ENERGY:

- **Used for water pumping in the islands of Atiu, Mauke & Mitiaro.**
- **Used for battery charging for telecommunication.**

BIOMASS (Firewood):

- Commonly used for cooking (main source of fuel for household needs.)
- Charcoal - used at times for cooking, heating & ironing.
- TWO Wood burner projects undertaken on the island of Mauke and Rarotonga. Due to economic cost failed.

BIOGAS (Digester):

- TWO pig digester were operational on Rarotonga mainly for trial purposes. Unfortunately due to limited skills and equipments for trapping the gas, projects failed.

TODAY (1990 – 2008) WHAT WE HAVE

SOLAR ENERGY:

- WATER HEATING:
  - Today it is common to see Hot Water Heating panels on new houses – with 3 overseas suppliers available.
- POWER SUPPLY:
  - 1992 - Nassau 1 community PV system (over its life span with no replacement)
  - 1994 - Pukapuka 120 households and 3 community halls (currently about 60% system working and waiting for rehabilitation)
  - 1996 -2000 - Telecommunication System for satellite communications on the islands (managed by TCI) as backup for the communication network in the Cook Islands.
  - 2000 – 2008 - One private accommodation PV system on the Island of Mauke & Few households on Rarotonga.
  - Solar water pumping system for Mauke Island replacing wind/solar systems.

WIND ENERGY:

- 2 * 20kW Vergnet Wind turbines installed on the island of Mangaia as pilot project (today only 1 system is back on line while 1 is under repair)
- 2 * Wind resource assessment tower installed on Aitutaki (now completed) & Rarotonga (10 months and in progress).
- 1 * 300W wind turbine on private home in Rarotonga (working)

BIOMASS (Firewood):

- Still common today but on a lower scale with minimal use.

OTHER RENEWABLE ENERGY BEING RESEARCHED:

- WAVE POWER :
  - A study was conducted on Rarotonga by SOPAC -2004 (result yet to be realised)
- OTEC (Ocean Thermal Energy Conversion)
  - 2005 Government actively pursued together with Palau feasibility study on viability of OTEC, Government had an interest in nitrogen by-product
- OCEAN CURRENT:
  - Government currently finalizing MOU with ADB for feasibility study on ocean currents

OTHER RENEWABLE ENERGY BEING RESEARCHED:

- WOOD GASIFIER:
  - A study was conducted on Rarotonga and Mauke in the past unfortunately did not eventuate due to economic factors (unable to compete with diesel power)

TOMORROW (2009 -2010) OUR FUTURE OPTIONS

WIND ENERGY

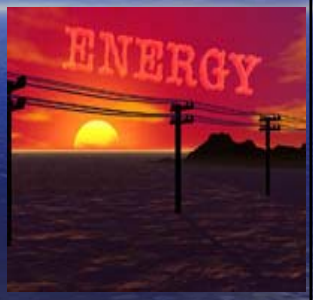
- RAROTONGA WIND PROJECT GRID CONNECTED:
  - Monitoring to be completed by May 2009
  - 6 months data recorded so far average 6.5 – 7m/s
  - Feasibility study proposal 200kW potential.
- AITUTAKI WIND PROJECT:
  - Monitoring completed
- MITIARO WIND RESOURCE ASSESSMENT PROJECT:
  - Monitoring equipment from Aitutaki will be relocated to Mitiaro in 2008

Other Renewable Energy Project being considered:

- A memorandum of understanding (MOU) has been prepared for "OCEAN CURRENT" technology to be researched in the Cook Islands in the near future.
- BIO-FUEL - focus in the northern group of the Cook Islands mainly to supplement fuel for transportation and power generation.

COOK ISLANDS RENEWABLE ENERGY STRATEGIC PLAN

- Alternative energy committee set up 2008 to boost up the development of RE in the Cook Islands.
- Draft renewable energy strategic plan being developed by the committee.



WHAT ARE THE ISSUES ENCOUNTERED?

- Limited capital for Investment.
- Technology transfer/skills.
- Land Issues.
- Investors reliability.
- Equipment reliability.
- Sustainability – financial support.

OUTPUT FINDINGS WIND

- Cost dependent on wind-day capacity
- Intermittent/irregular source
- Prone to power surge damage in small systems
- Electronic failures due to environment

Overall performance is good and can be improved

SOLAR

- Cost dependent on average sun-days
- Intermittent source
- Cost of inverters expensive
- Specialized home appliance costs are high

Overall performance – Accepted by remote atoll islands

FUTURE ENDEVOURS

- Work/Develop RE as a way for us
- Require total participation by all stakeholders involved
- Technological upgrades/skills
- Information exchanges
- Working collectively
- Environmental issues - tropicalization

FROM THE COOK ISLANDS

KIA ORANA

AND

LETS DANCE

PNG TEACHERS SOLAR LIGHTING PROJECT (TSLP)

Renewable Energy Workshop presentation

VANUATU

by

Joseph Dar
Rural Energy Project Coordinator

Background

- PNG Dept. of Education request assistance from World Bank
- US$992 000 GEF Grant Project
- World Bank is the implementing agency
- PNG SEL is the executive agency in PNG
- 5 years project
- To be trailed in 6 provinces

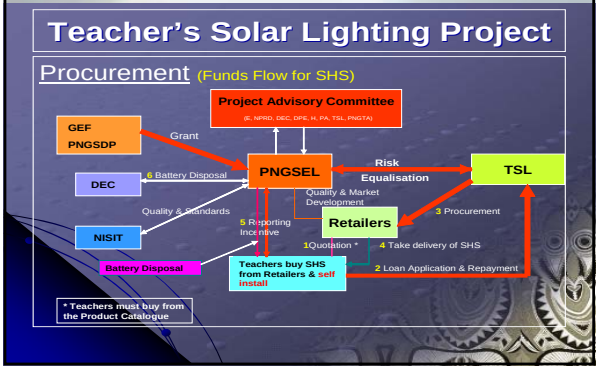
Project Objectives

- To improve the livelihood of Teachers, health and other public servants in rural areas
- To create early markets and awareness of solar PV technology and
- build the capacity of market participants

Project Stakeholders

- World Bank
- PNG SEL
- Advisory Committee
- Teachers Savings & Loans
- Retailers
- Department of Environment & Conservation
- National Institute of Standards and Industrial Technology (NISIT)

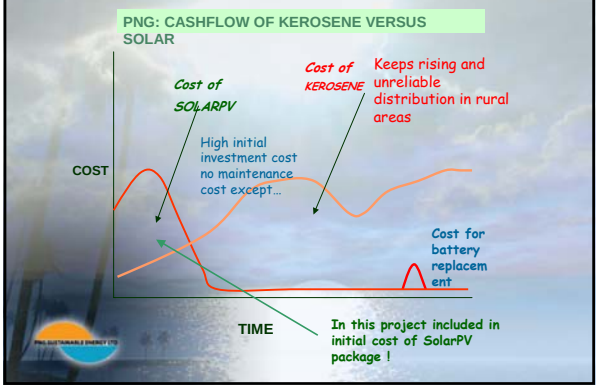
Project Implementation Structure



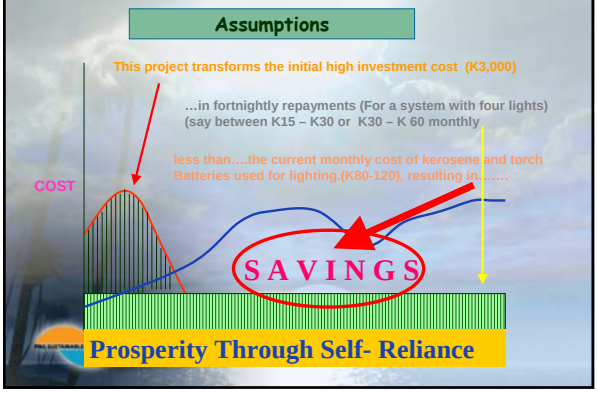
Implementation Arrangement

- Select solar system from a product catalogue
- Get quotation from an approved retailer (including cost of replacement battery)
- Apply for 5 years loan with TSL (including cost of replacement battery)
- Present cheque to retailer and collect solar lighting system
- Repay fortnightly through salary deduction

Cost of Kerosene Versus Solar PV



Benefits of Solar lighting kits



Productive Uses of renewable energy services

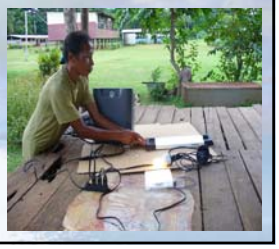
- Improve delivery of education and public health
- Cost saving on kerosene fuels
- Help mothers with their household duties
- Reduction in use of firewood for lighting
- Less environmental pollution
- Significant adoption and use of solar PV technology
- Encourage financial institution to provide loan financing

STATUS

- Product catalogue ready to go to printing
- Teachers Savings & Loans MIS modification nearing completion
- Interactive Video Training program reaching final stages
- Two retailers have been selected for supply (One brought in 200 SHS into the country)
- Media Awareness materials in preparation stage
- Loans should be expected to start by end of May

Problems

- Local firms with limited financial capacity to participate effectively
- More parties involved leading to delays
- Remoteness making accessibility difficult for teachers



THANK YOU

Grant Behrendorff

Group Manager, Business Development
Centre for Appropriate Technology

BUSH LIGHT

1. What is Bushlight?
2. Project Outcomes
3. The Bushlight approach to rural electrification
4. Lesson's learnt

What is Bushlight

- Indigenous community renewable energy program
- Northern and Central Australia
- Work with small communities 5 – 200 people to implement renewable energy systems
- Funded by the Australian Government
- 30 people, Offices in 4 locations
- Operating for nearly 6 years
- Work as project facilitators and managers – not system installers

"Improved livelihood opportunities for people in small remote indigenous communities through the provision of sustainable renewable energy services"

Project Outcomes

- Implemented RE systems in 110 communities to date
- Employment opportunities
- Improved livelihood outcomes
- Very high system reliability (>99.5%)
- Very high community satisfaction
  - Impact assessment
  - Case studies
- Happy funders and government stakeholders (funding for the project been extended twice)
  - AUD $40m to date with commitment of further $24m
- National and international recognition as best practice

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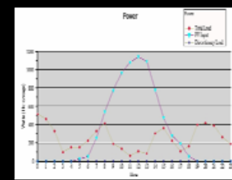

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WINNER AUSTRALIAN ENGINEERING EXCELLENCE AWARDS 2006 ENGINEERS AUSTRALIA

BUSH LIGHT

'The Bushlight approach'

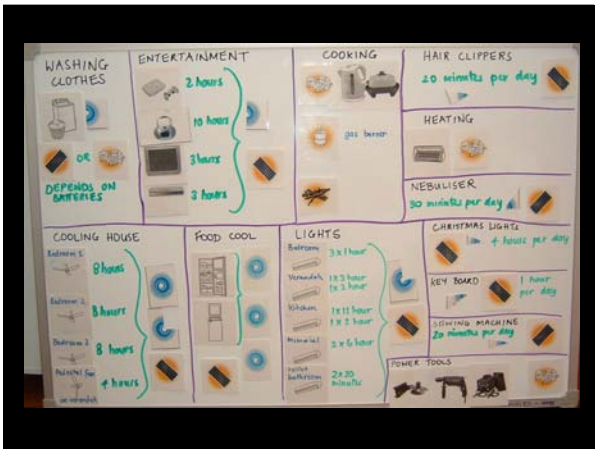
Focused on

1. Building community capacity to manage energy services
2. Improving RE system reliability and performance
3. Improving the support network

'Bushlight Community Energy Planning Model'

BUSH LIGHT


Light and Life in the Bush


WASHING CLOTHES
OR
DEPENDS ON BATTERIES
ENTERTAINMENT
2 hours
10 hours
3 hours
3 hours
COOKING
gas burner
HAIR CLIPPERS
20 minutes per day
HEATING
NEBULISER
30 minutes per day
COOLING HOUSE
8 hours
8 hours
8 hours
4 hours
FOOD COOL
LIGHTS
3 x 1 hour
1 x 3 hour
1 x 3 hour
1 x 11 hour
1 x 3 hour
3 x 6 hour
2 x 20 minutes
CHRISTMAS LIGHTS
4 hours per day
KEY BOARD
1 hour per day
SEWING MACHINE
20 minutes per day
POWER TOOLS

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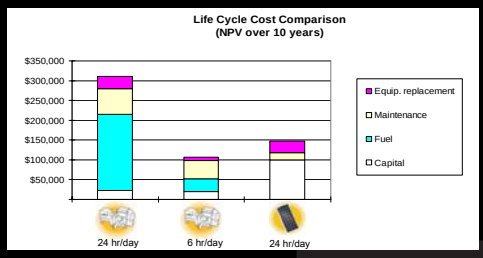
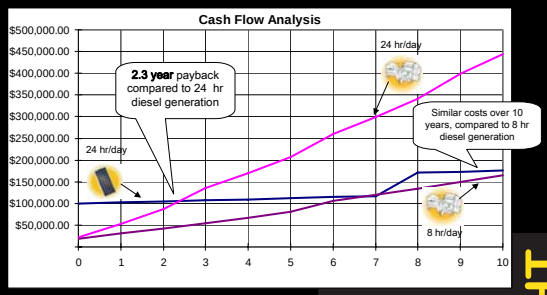
'Bushlight Community Energy Planning Model'

BUSH LIGHT

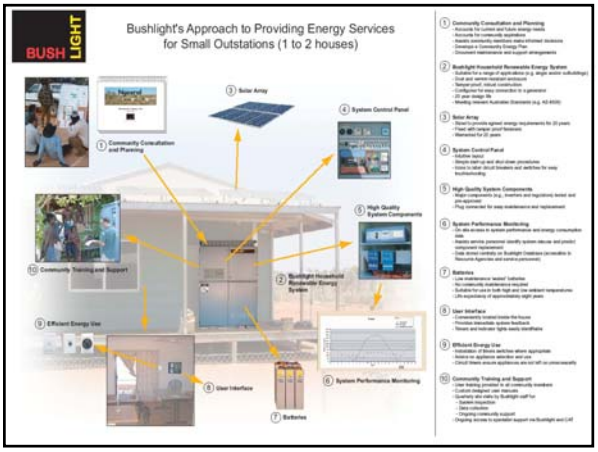


- 4 house community
- 200 km from service centre
- Delivered fuel cost $1.60
- Education and training focus
- Community members change oil in genset
- Mechanic services genset every 3 months

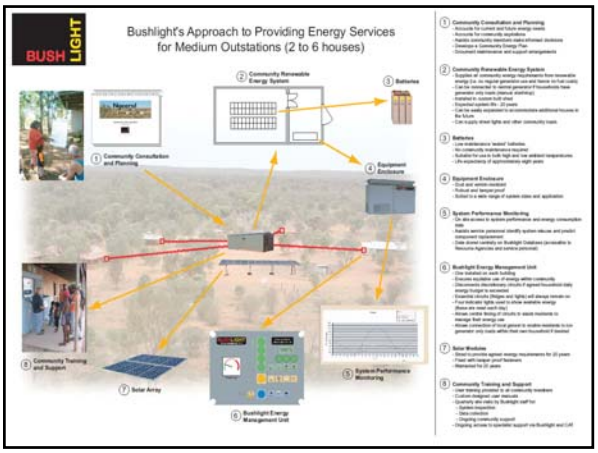
BUSH LIGHT



BUSH LIGHT




BUSHLIGHT
Remote Control Box
Fault
Power
Battery
Timed Circuits
Power


BUSH LIGHT
Bushlight's Approach to Providing Energy Services
for Medium Outstations (2 to 6 houses)


BUSHLIGHT
Energy Use Meter
Power available
when lights are on
Power Use

'The Bushlight approach'

Focused on

1. Building community capacity to manage energy services
2. Improving RE system reliability and performance
3. Improving the support network

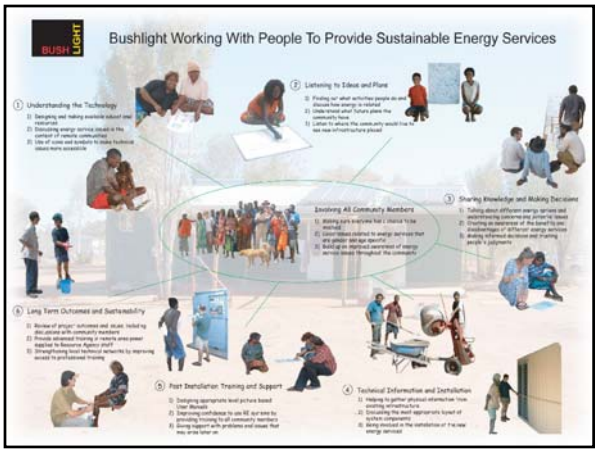
'Bushlight Community Energy Planning Model'

BUSH LIGHT

The Bushlight Community Energy Planning Model:

- Participative planning model based on the 'Sustainable Livelihoods' approach
- Exchange of information to enable:
  - Residents to make informed decisions about energy use in their community
  - Bushlight to design an appropriate renewable energy system
- Document agreements about:
  - The way energy will be used within the community
  - Financial model - community contributions to the cost of operating and maintaining the system
  - Maintenance and support arrangements

BUSH LIGHT



Recommendations

- Community consultation and involvement in decision making
- Appropriate and sustainable financial model (including policy for equitable access to energy)
- High quality system design
- Training and education for residents
- Reliable and well trained support network

Robust Implementation Model

BUSH LIGHT

Light and Life in the Bush

Centre for Appropriate Technology

www.icat.org.au

www.Bushlight.org.au

grant.behrendorff@icat.org.au

BUSH LIGHT

SOPAC

Rupeni Mario, Energy Adviser, Community Lifelines Programme

Productive Utilisation of Renewable Energy in the Pacific

SIS Capacity Building Workshop on Renewable Energy Technology Applications
Melanesian Hotel,
Port Vila, Vanuatu: 21 - 25 April 2008

SPREP

Solar PV – Namdrik Atoll (Marshall Islands)

SOPAC

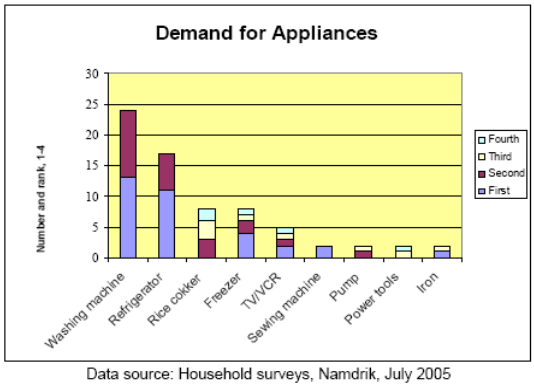
Background

- rehabilitate an existing project
- a substitute for kerosene, candles or dry cell batteries used for domestic lighting
- did not appear to adequately take into account the inevitable growth in expectation and demand that is typical of newly electrified communities
- aware of the growth in demand during the refurbishment project, and noted that use of TV/DVD and radios had grown very significantly

SOPAC

- the project – initial approach – a substitute for kerosene, candles, & batteries for lighting
- monthly tariff = US$12.00 – only 29 % of households are classed as up to date as at May 2005. 57% are connected but are behind in payments, collectively owe US$4,600 and average of 7 weeks behind. 12% of households have been disconnected and a further 11% are disconnected having never paid the $100 connection fee
- payment mode – use of copra as an alternative (issues: not MEC's core business, copra price not constant, prolonged transportation will leave MEC hard-up with cash-flow for the solar systems

SOPAC



Data source: Household surveys, Namdrik, July 2005

SOPAC

Impacts – responses to the survey

HEALTH

The Health Assistant states that electrification has not had any real impact on health. The Dispensary has **just been refurbished, and has a solar installation inadequate for anything except lighting**.

EDUCATION

The school principal finds that there has been **no improvement in education as a result of the solar project.** He is from Namdrik, but was not teaching at the school at the time of the first project. However, in his experience when electrification came to Ailinglaplap, students performed worse in examinations, due, he felt, to the greater distractions in the home. He observes the same trends on Namdrik.

SOPAC

Impacts – responses to the survey

ECONOMIC

Solar home systems have not substantially enabled people to diversify their livelihoods. This is a source of frustration to many respondents, since they now have a perception of what is possible if one has electricity, and this vision is still unattainable. **Incomes have improved slightly,** mainly due to improved quality of light that permits women to work on handicrafts at night.

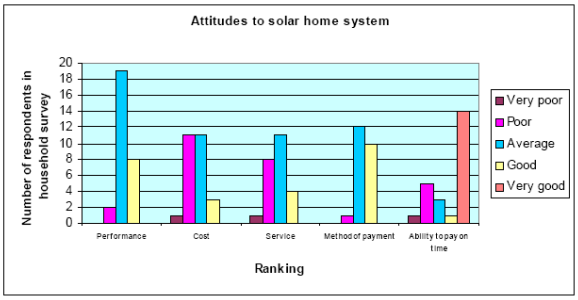
SOCIAL & CULTURAL

Better light at night **permits visiting and chatting with friends, sharing a video, reading the Bible or playing games together.**

SOPAC

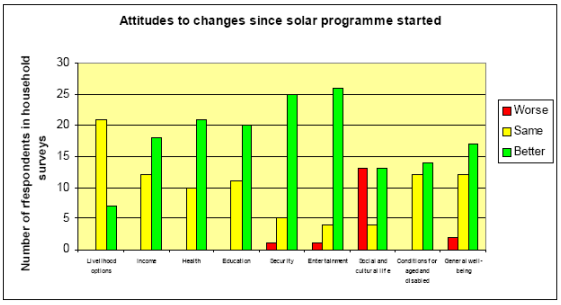
value for money

- Namdrik receives 6 hours of solar radiation per day on average,
- each system generates about 15 kWh of power per month.
- effective tariff is thus $0.80 per unit. The cost per unit on Majuro for lifeline consumption (500 kWh per month) is $0.11.



SOPAC

overall assessment of impacts



Data source: Household surveys, Namdrik, July 2005

SOPAC

Some Lessons

Economic – unless there is a conscious focus on productive uses of power, solar home systems tend not to have a positive economic impact; to the contrary, as a very expensive way of achieving better lighting, they drain cash from the Outer Islands economies.

Contracts need to be clear and unambiguous – within 2 or 3 years of installation of SHS systems, consumers will want AC power sources to drive higher demand appliances.

A vehicle for delivery or many messages, about health, education, production and prices, weather forecasts, new livelihoods activities. Impacts are fastest and most favourable when a co-ordinated and multi-sectoral approach is taken.

On Namdrik, opportunities were lost to enhance the impacts of the projects by **failing to integrate socially and economically productive applications** at the time of installation.

SOPAC

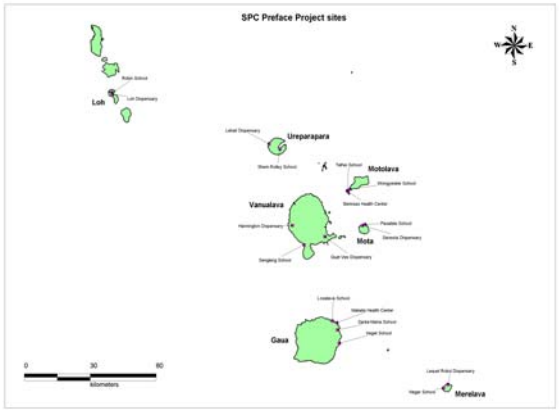
THANK YOU

TORBA PREFACE PROJECT

Energy Unit
Ministry of Lands
The Republic of Vanuatu

PROJECT BACKGROUNG:

- **FUNDING - Australian and the French governments (Pacific Renewable Energy France & Australia Common Endeavour) through the Pacific Community (PC).**
- **IMPLEMENTED – August/September 2001**
- **LOCATION - Torba Province (on 7 islands of Banks and Torres) the northern tip of the Republic of Vanuatu.**
- **SYSTEM CAPACITY – 6.3 kW**
- **NUMBER OF SITES – 18**
- **NUMBER OF SYSTEMS – 62 (40 SHS & 22 CFS)**
- **HEALTH SECTOR – 8 sites**
- **EDUCATION SECTOR – 10 sites**
- **BENEFICIARIES – Remote Schools and Health Facilities (Public facilities and staff houses).**



SPC PREFACE

LIST OF T3P SITES (TORBA SPC SOLAR PHOTOVOLTAIC PROJECT):

System installation on August/September 2001.			Facility Type				
Island Group	Island	Site	Health		Schools		Total systems per island
			Community Systems 150 Wp	Staff Houses 75 Wp	Community Systems 150 Wp	Staff Houses 75 Wp	
	Gaua	Losalava School			1	4	
		Santa-Maria School			1	4	
		Vaget School			2	3	
		Melata Health Center	1	3			19
	Merelava	Negar School			2	3	
BANKS		Lequel Robul Dispensary	1	1			7
	Mota	Pasalele School			1	3	
		Saraw ia Dispensary	1	1			6
	Motalava	Telhei School			1	4	
		Wonpyeskel School			2	3	
		Bemicas Health Center	2	2			14
	Ureparapara	Shem Rolley School			1	2	
		Lehali Dispensary	1	1			5
	Vanualava	Hannington Dispensary	1	1			
		Quat Vas Dispensary	1				
		Sangiang School			1	2	6
TORRES	Loh	Robin School			1	2	
		Loh Dispensary	1	1			5
	A total of 18						
	sites on the 7	TOTAL	9	10	13	30	62
	islands of Torba	40 = 75 Wp systems					
	Province:	22 = 150 Wp systems					
Battery Sizes:		6 volts at 2 batteries to a capacity of 218 Ah are installed inpublic buildings:					
		6 volts at 2 batteries to a capacity of 213 Ah are installed in staff houses:					

SYSTEM SPECIFICATIONS

Two types of solar kits were provided:

A. Community System Facility Kit (CSF);

The kit comprise of a 2 @ 75 Wp @ 19 Volts solar photovoltaic modules, 20 Amps regulator and two 6 volts seal batteries @ 218 Ah that operates:

- maximum 10 inside lights @ 13watts
- 1 outdoor light @ 13 watts
- 1 night light (solled led lamp) @ 0.35 watts (health facilities only)
- 1hallogen light(delivery lamp) @ 35 watts

B. Solar Home System Kit (SHS);

The kit comprise a 75 Wp @ 19 solar photovoltaic module, 20 Amps regulator and two 6 volts sealed batteries @ 213 Ah that operates:

- 3 inside lights @ 13 watts
- 1 outdoor light @ watts
- 1 night light (solled led lamp) @ 0.35 watts

PROJECT MANAGEMENT

The Energy Unit has the overall management of the project. The project management team includes;

Project Officer in-charge – Energy Unit

A team of 6 Caretakers – Provincial Level (stationed in the islands) takes care for the basic maintenance and reports to the senior caretaker based in Sola. The senior caretaker reports to the Energy Officer in-charge to the project.

Stakeholders involved – Torba Provincial Offices (PEO & PHM).

MAINTENANCE FEES/REVENUES

Annual revenues from the beneficiaries;

Education Department:	- 468,000 vt
Health Department:	- 324,000 vt
Teachers & Nurses:	- 720,000 vt
Total	**- 1,512,000 vt**

Method of Calculations; Public systems = 240vt/wp x 150 watts x No. of systems (22).
Staff systems = 20vt/wp x75w x No. of systems (40) x months/yr.

SHS KITS

- For an effective mechanism in place for the staff salaries to be deducted for the maintenance of the service rendered by these systems, two forms were created;

1. AUTOMATIC SALARY DEDUCTION AUTHORITY FORM
2. AUTOMATIC SALARY DEDUCTION TERMINATION FORM

The staff salaries were only eventuated on March 2004.

ANNUAL MAINTENANCE & OPERATION COSTS

Please refer to PV maintenance spreadsheet

SPARE PARTS

Please refer to PV maintenance spreadsheet

COMMITTED FUNDS

Spare Parts;

▪2004 purchase of 100 lights	-	308,000 vt
▪2005 purchase of 50 lights & 2 batteries	-	374,194 vt
▪2006 purchase of lights, regulators & batteries	-	555,900 vt
Sub TOTAL 1	_	**1,238,094 vt**

Maintenance Mission & Others;

▪2004 check and maintenance visit	-	321,600 vt
▪2005 facilitate storage materials, luganville	-	20,100 vt
▪2005 Project sites inspection visit	-	329,693 vt
▪2004 facilitate storage materials, luganville	-	29,950 vt
▪2006 Assessment of Project (SOPAC)	-	113,000 vt
Sub **TOTAL 2**		**814,343 vt**
Grand TOTAL	-	**2,052,437 vt**

RECIPIENTS OUTSTANDING FEES

Department of Health; - 324,000 vt per year @ 4years
(2003/2004/2005/2006)
= 1,296,000 vt

Department of Education; - 468,000 vt year @ 2 years
(2005/2006)
= 936,000 vt

TOTAL = 2,232,000 vt

Other Commitments beyond system maintenance alone.

- Relocation of the systems from present installation to a new house
- A case where the whole site (school) be relocated.
- Requests to expand system on existing site to accommodate more staff to the schools; center school approach.

TANKIU TUMAS

RENEWABLE ENERGY IN NIUE

Capacity Building Workshop on Renewable Energy Technology Applications
Melanesian Hotel, Port Vila, Vanuatu, 21-25 April 2008

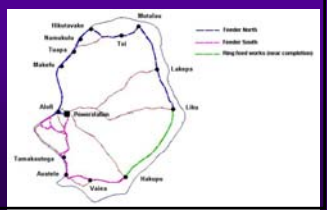
Presenter: Speedo Hetutu
General Manager
Niue Power Corporation

Government of Niue's Objective on Renewable Energy

- To maximize the contribution of appropriate, proven and cost-effective renewable technologies to help meet Niue's energy needs.
- To minimize Niue's dependence on petroleum products by actively encouraging fuel conservation efficient end-use

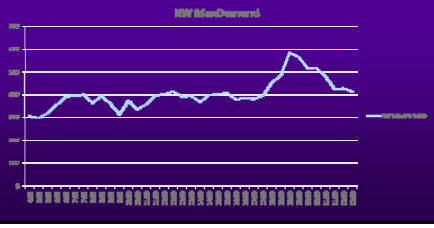
Energy Availability

- 98% available to all customers
- One Supplier Niue Power Corporation
- 90% Under Ground and 10% Overhead
- 11kV Transmission System



Utility Statistics

1.	Install Capacity	2.2MW
2.	Peak Demand	565kW
2.	Minimum Demand	280kW
3.	Customers	1,010
4.	Tariff	48 cents NZ Domestic
		78 cents NZ Air-Condition



History of Renewable Energy

- 1980's Solar Water Heaters
- 1982 PV Sea Track Lights
- 658Wp PV Stand Alone for the Community Hall in one of the village.

History of Renewable

- 1996 – 1,365Wp Solar Water Pump PV Automation Tracking System was installed. Funded by AusAID

Cont.. History of RE's

- 1994 – 1997
  9 meter wind tower was installed
  average of 5m/sec was recorded
- 1999 in Denmark Niue indicated
  of looking at installing Wind Power

Future of Renewable Energy

- 2005 - EDF 9, EU provided funding to install Wind Power but was later change to;
  - * Energy Efficiency
    *LPG Gas Cooking
    *Solar Water Heaters
  - * 30kW PV Grid Connected System
- **<u>Main Objective Reduce diesel by 20% for power generation</u>**

Where is Niue Heading with Renewable Energy?

- Govt has agreed that more Renewable Energy Grid Connected to one of the major component for EDF 10.
- Govt has given Niue Power Corporation duty plan and install more RE in the next 5 years.
- To work with regional and international organization's in investing more on RE.
- Support the work of PIGGAREP.

Renewable Energy is the way to go for future needs.

Thank-you

WHAT IS PURE?

- P PRODUCTIVE
- U UNTILSATION
- R ENEWABLE
- E ENERGY

SERVICES

UN PURE- MEANS

- U UNDEVELOPE
- N NATIONS
- P PRODUCTIVE
- U UNTILSATION
- R RENEWABLE
- E ENERGY

SERVICES

WELOME TO MY PRESENTATION

- MY NAME IS DAVID IRO FULAGA FROM SOLOMON ISLANDS
- MY PLEASURE TO SHARE WITH YOU OUR PARTCIPATION AND DIRECT INVOLMENT IN PV SOLAR WITH THE COMMUNITIES, GOVERNMENT, DONORS,AND BUSSINESS IN SOLOMON ISLANDS

RENEABLE ENERGY TRAINING CENTRE – SOLOMON ISLANDS

VISSION

TO GROW IN PEACE,CLEAN ENVIRONMENT AND SERVE GOD.

MISSION

TO EMPOWER MEN,WOMEN AND YOUTHTHROUGH USE OF GREEN ENERGY FROMTHE SUN,VENTURING TOWARDS THE PEACEFUL SHORE OF CLEAN ENVIRONMENT

Pilot on the wheel

The new library, training and resource Centre ,provide technical, resource Material to open training centers in the provinces.

The PV solar technology has great impact on peoples live so far.

However challenges to maintain and Convert the electricity to improvement Small village business is yet to achieve

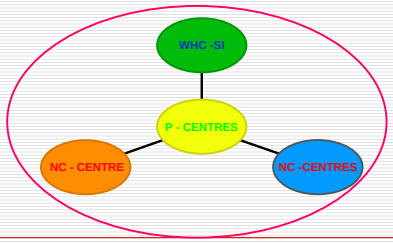
Demand for training and technical Expertise from outside is a national Training need

SITAFE –Training Program

- Electrical trade preparatory course
- Electrical Trade assistance level one
- Electrical trade assistance level two
- Basic solar power courses
- Community on the job training
- Empowering women and youth using PV solar electricity in small business

SALES AND SKILLS DEVEOLPMENT PATHWAY 2005 - 2010

- ELECTRICAL AND PHOTOVOLTATIC SALES AND SKILLS TRAINING FOR SOLOMON ISLANDS COMMUNITIES



TECHNICAL DEPARTMENTS

- TRAINING – OFF THE JOB
- STORES AND SUPPLY – BUSSINESS PRACTICE
- CONTRACTING – ON THE JOB

STRENGHTS IS PARTNERSHIP

- **SITAFE** – DONORS, AND SIG
- **PROVINCIAL CENTRES** –SITAFE , DONORS AND NATIONAL MEMBER
- **CONSTITUIENCY CENTRES** –SITAFE, NATIONAL MEMBERS
- **WARD CENTRES** – SITAFE , NGO AND WARD MEMBERS

CHARLLENCES TO OVER COME

- NEW APPROACH FOR VILLAGE DEVELOPMENT
- REQUIRE HUMAN RESOURCE DEVELOPMENT ON SCHEDULE
- REQUIRE ASSISTANCE TO ESTABLISH TECHNICAL DEPARTMENTS
- STRENGTHEN PROJECTS OLD AND NEW

FOCUS COMMUNITY SOLAR PROJECTS 2007- 2010

EMPOWERING MEN AND YOUTH

- BATTERY RECHARGE STATION
- HOME CLEAN LIGHTING SYSTEMS
- CHURCH LIGHTING SYSTEMS
- SCHOOL LIGHTING SYSTEM
- CLINIC LIGHTING SYSTEM
- CUSTOM AND CULTURE PRODUCT MANUFACTURING
- MULTI SKILLS TRAINING CENTRE
- WINDOW TO THE WORLD CENTRE

EMPOWERING WOMEN AND YOUTH

- PROVINCE CHILDRENS WEAR MANUFACTURING
- ISLAND FRUIT JUICE MAKING
- MINI FREEZER – 150L
- FAMINLY SEWING BUSINESS
- VILLAGE HOME STAY
- PORE HOLE WATER PUMPING
- CRIME PREVETIONS AND COMMUNICTION
- HEALTH AND LITERACY CENTRE

EPOWERING WOMEN AND YOUTH

- **Mother in village demonstrate use of sewing machine making children's ware**
- **Bishop Kite and provincial member eye witness.**
- **Temotu province take the lead in sewing children's ware today**
- **Honiara centre leading up in school uniform making, Challenging the PV solar electricity**

COMMUNITY EMPOWERING

- Empowering women and men together is a potential to drive the renewable energy forward in the pacific as many family members still energy illiterate

VILLAGE CHIEFS TO LEAD THE WAY

- COMMUNITY CRIME PREVENTIONS.
- Youths must encourage come out to say sorry in and participate

COMMUNITY CRIME PREVETION

- VILLAGE CRIME PREVETION NOTICES
- Local government work in partnership with communities ,business
- COMMUNITY POLICE - HF RADIO STATIONS

CELEBARATION TIME

- During the national days like independence week it has been very successful to participate in the national trade show do community awareness

2008 INCOME GENERATION

- Community crime prevention awareness
- Health awareness
- Community Skills education program
- Custom and culture meetings
- Church meetings
- Radio communication –HF Radio
- Start small business for women

PV SOLAR VS KEROSINE FUEL

TAKAO COMMUNITY PEANUT FARMERS

- 25 WOMEN RAISE MONEY FOR BASIC SOLAR LIGHTING
- SEED FUND OF $100 SBD - $20 AUD GIVEN TO TEAM LEADER
- 3MONTHS FINANCE REPORT $9,000. 00 RAISED

WORLD BANK PROJECT- 2008

- 18TH APRIL 2008 WILLIES ELECTRICAL WON THE WORLD BANK TENDER AS THE APPROVED PV SOLAR PRODUCTS SUPPLIER IN THE COUNTRY

WESPAC SIGNAGE SOLAR POWERED

- SECOND BANK TO USE RENEWABLE ENRGY- SIGNAGE LIGHTING AT NIGHT-AUTOMATIC

ANZ BANK ATM SOLAR POWERED MUNDA

FIRST ANZ BANK ATM MACHINE SOLAR POWERED

- TETERE ATM NOW SERVICE MORE THAN 2000 EMPLOYERS AT GPPOL PALM OIL PLANTAION
- 6 ANZ BANK ATM INSTALLED RECENTLY IN THE 9 PROVINCES

2008 – 2010 EXPANSION PROJECTS

- BULK SUPPLIER OF ENERGY EFFICIENCY LAMPS AND FITTINGS
- SOLAR –GRID POWER DEMONSTRATIONS
- EMPOWERING WOMEN AND YOUTH IN BUSSINESS

THANK YOU - END

PNG SUSTAINABLE ENERGY LTD

RENEWABLE ENERGY WORKSHOP

Vanuatu

WESTERN PROVINCE VILLAGE SOLAR LIGHTING PROJECT

Presented By Joseph Dar

Village Solar Lighting Project

Project Brief

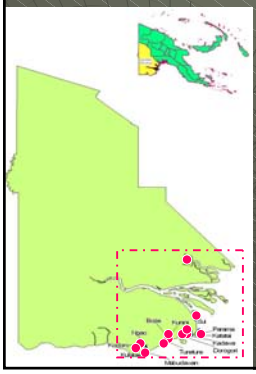
- PNGSDP Commissioned a rural electrification study in Western Province.
- Based on this survey 6 mini-grids and Village solar lighting project (VSLP) was implemented as W/Province Phase 1
- Funded by PNG SDP
- VSLP Covered 12 villages

Village Solar Lighting Project

PROJECT OVERVIEW

- All Individual household in a village is given a solar home system (SHS)
- 50Wp solar module with 3 lamps for lighting
- Connected 805 houses which has a population of over 4000 people
- Monthly collection of K10 for 3 years
- PNGSEL provide spare parts and technical services but at cost to SHS users
- 150 SHS left for more connections

Village Solar Lighting Project



VILLAGES :

1. Kadawa
2. Sui
3. Parama
4. Tureture
5. Kunini
6. Boze
7. Kulalai
8. Kodoro
9. Ngao
10. Dorogori
11. Katatai
12. Emeti

Village Solar Lighting Project

PROJECT CYCLE

- Rural energy study by Hydro Tasmania & SMEC
- Village selection by PNGSDP for trail project
- PNG SEL tasked to execute rural energy report
- Solar home system as best technical option
- Tender specifications
- Tender process
- Award of contract to Suntel of China
- Installation
- Operations & Maintenance
- Expansion

Village Solar Lighting Project

BENEFITS

- Better lighting for households (improved living conditions)
- Improvement to quality of education and health
- Extended hours of work (increase in production)
- Minimal pollution to environment
- Better price through competitive Tendering
- Reduced cost of energy – long term
- Incentive for people to be more industrious

Grid-connected PV

40kW Solar Power Generation Project in Tuvalu

(Overview of Design & Installation)

Project Conceptual Drawing | Project Actual View

Presentation Prepared by The Kansai Electric Power Co. Inc.,

Presented by Mafalu LOTOLUA

Tuvalu Electricity Corporation

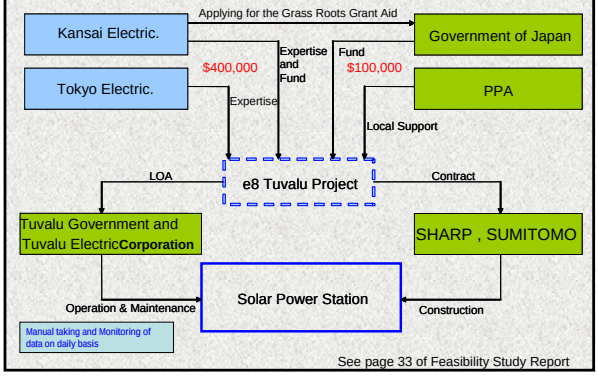
Background Information

- Project site identification – During the e8 RE Workshop in Nadi, Fiji in Nov 2005.
- Letter of Agreement (LOA) signed -June 2006
- Construction Starts - November 2007
- Inauguration Ceremony - 21-February-2008
- Warranty Period – 2 yrs
- Monitoring Period – 2 yrs

} Exactly 2 yrs from identification to construction

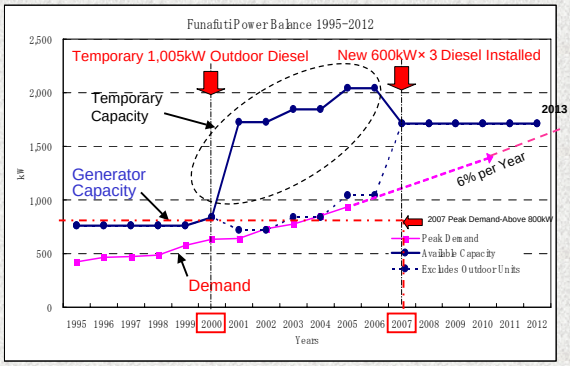
Background Information

Project Framework



See page 33 of Feasibility Study Report

Increasing Electric Power Demand

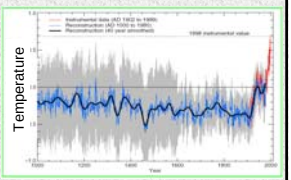


See page 13 of Feasibility Study Report

Overall Goal of the Project

Increase of Diesel Fuel Price

Global Warming by CO^2



Fuel Price April'08 – W/S-$1.8750, D/F – $1.8050/ltr [from 2006 to Mar'08 increase approx. 26%]

1. From full diesel reliance to renewable hybrid generation.
2. To reduce CO^2 emission and fossil fuel consumption.
3. To be a successful model of grid-connected solar power in the Pacific Region.
4. To send a symbolic message to the world from Tuvalu.

See page 14,15 of Feasibility Study Report

Renewable Energy Resources in Tuvalu

Resources	Comments
Micro Hydro	Hydro power resource is not available, because there are no rivers.
Biomass	There is limited land and soil. Although a small amount of coconut trees and husks are available, it is now used for cooking.
Wind	Appropriate wind blows only between November and March. In addition, there are no good wind points, since atolls are low lying. [TEC still monitoring wind speed and so far data are promising. More information on the Wind Assessment Presentation]
Tidal	The island sits upon a coral shelf that is porous like a sponge; therefore it is quite difficult to store huge amounts of water.
Solar	The rainy season lasts from November to April, but it never rains continuously. Located at 8 degrees south latitude, abundant and good solar radiation (more than 5 kWh/m^2/day) can be expected through the year. [In comparison, Japan had only about 3kWh/m^2/day)

See page 15 of Feasibility Study Report

Result of Case Practice in PPA workshop

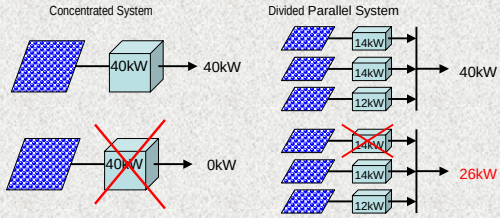
Who is the best ?

Team name	Annual Insolation (MJ/m2Year)	Lat. (deg)	Annual Generation Power (kWh/Year)	Utirization Parameter Ug (%)
Cook Is.	Rarotonga 6442.58 MJ	21.18S	1343.5	15.3
Fiji	Nandi 6821.60 MJ	17.75S	1392.7	15.9
Kiribati	Tarawa 7685.50 MJ	1.35N	1494.8	17.1
Niue	Asau(Samoa) 8064.43 MJ	13.50S	1612.6	18.4
PNG.	Port Moresby 7291.01 MJ	9.48S	1437.3	16.4
Samoa	Apia 7106.19 MJ	13.80S	1422.8	16.2
Solomon Is.	Honiara 6647.90 MJ	9.42N	1310.3	15.0
Tonga	Port Vila(Vanuatsu) 6251.58 MJ	17.75S	1276.3	14.6
Tuvalu	Funafuti 6722.20 MJ	8.52S	1321.7	15.1
OSAKA (Japan)	Osaka 4625.00 MJ	34.70N	1093.9	12.5
			(For 1 kW PV)	

System Design Policy

1. Reduce Construction Cost.
   - Select commonly used equipment. (Easy to buy)
   - Use Stadium Roof for installation structure.

2. Divided Parallel System to avoid full-shutdown trouble.



See page 23 of Feasibility Study Report

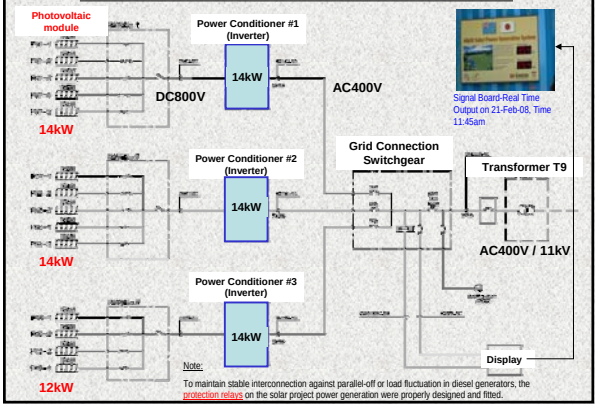
System Design Policy

3. Protect against natural contamination.
   - Against Salt contamination.
   - Against Ultra Violet.

4. Without Battery Storage.
   - Regarded as hazardous waste to the environment
   - Have short life span approx 10yrs

See page 23 of Feasibility Study Report

System Diagram of 40kW Solar Power Generation



Frequency and Voltage Fluctuation

- Frequency Fluctuation
  - Setting one set to come on line, fluctuation from 48.5-50.5Hz and occurs for about 5 secs
  - When one set is parallel-off, fluctuation is about +/-0.3HZ.
- Voltage Fluctuation
  - Setting one set to come on line, voltage reduced by 5% and occurs for about 300ms.
  - Range of fluctuation at the time of parallel-off one set is around 0.2%

Construction Cost (USD$)

A. Equipments & Materials	$ 280,000 (56%)
1. PV Module 40kW (256 modules, 132w)	$ 150,000 (30%)
2. Power Conditioners (14kW × 3)	$ 30,000
3. Frame & Structures	$ 30,000
4. Electric Cables	$ 40,000
5. Switching Boxes	$ 10,000
6. Display Panel	$ 10,000
B. Construction Works	$ 162,000 (32%)
C. Transportation	$ 58,000 (12%)
(Total)	**$ 500,000** (100%)

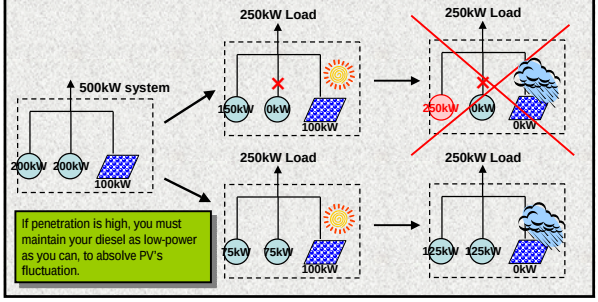
Construction Cost per "kW"

$\$500{,}000 / 40kW = \$12{,}500$ ($ / kW)

(In Japan $6,000 ~ $8,000)

Why 40kW was chosen?

1. Budget Reason.
   - Budget is $500,000. ($100,000 is by JP Govt.)
2. Cooperation with Diesel.
   -Project Solar penetration is 5% and can go up to 20%



If penetration is high, you must maintain your diesel as low-power as you can, to absolve PV's fluctuation.

Expected Vs Actual Total power Generation

40kW System

Month	Expected Daily Power Generation (kWh/day)	Actual Daily Power Generation (kWh/day)	Days/Month	Expected Monthly Power Generation (kWh/month)	Actual Monthly Power Generation (kWh/month)
January	157		31	4,867	
February	153	203	29	4,437	5,887
March	160	176	31	4,960	5,456
April	158		30	4,740	
May	146		31	4,526	
June	138		30	4,140	
July	141		31	4,371	
August	150		31	4,650	
September	158		30	4,740	
October	169		31	5,239	
November	155		30	4,650	
December	153		31	4,743	
Total		379	366	56,063	11,343

Saving Achieved for 2 months:-
- Fuel -2,949ltrs
- $$ - US4,000
- CO^2 – 10,000Kg (10tons)

(Calculation Condition)

Installation angle:	5deg. to north
Dirt coefficient:	0.97
Transformer efficiency:	0.98
Inverter efficiency:	0.92
Cable loss factor:	0.98

Load factor (System utilization factor)

$$\frac{56{,}063kWh}{40kW \times 24h \times 365day} \times 100 = 16.0\%$$

Cost Comparison of Power Generation

Solar Power

Annual Production of Electricity:-55920kWh (Annual Production)

Item	Annual Cost (US$)	Unit Cost/kWh (US$)	Note
Fuel and Lubricating Oil	-	0	
Depreciation	18,540	0.33	US$412,000 X 90% / 20yrs / 5920kWh economic life 20 yrs, salvage value 10%, straight line method
Operation & Maintenance	4,623	0.08	US$412,000 X 1% + US$503 1% of the original facility cost and system inspection (200 person-hr)
TOTAL	23,163	0.41	

Diesel Power

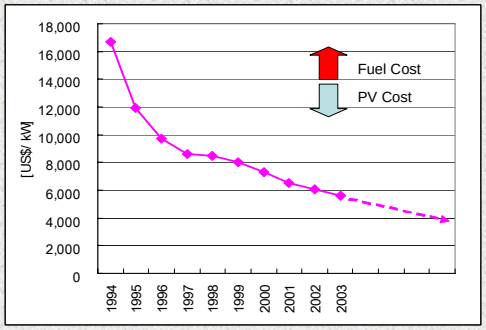
Annual Production of Electricity:-3,700,000kWh (Annual Production)

Item	Annual Cost (US$)	Unit Cost/kWh (US$)	Note
Fuel and Lubricating Oil	1,139,304	0.31	(0.261/kWh x 1.15 + 0.0021/kWh x 4.46 $/1) x 3,700,000kWh fuel 0.26/kWh x 1.15 $1, lubricating oil 0.0021/kWh x 4.46 $/1 Reference: Oil price hearing from TEC (Aug 2007), JICA Report page 60.
Depreciation	215,220	0.06	A$269,025 = US$3,587,000 x 90% / 15 economic life 15 year, salvage value 10%, straight line method Reference: JICA Report page 60
Operation & Maintenance	109,054	0.03	Personnel A$91,481 + Maintenance A$44,837 Reference: JICA Report page 60
TOTAL	1,463,578	0.40	

Almost same

Future Tariff Scenario

Trend of Construction Cost for 1kWSolar Power Generation System



See page 37 of Feasibility Study Report

Project Site

See page 14,15 of Feasibility Study Report

Project Main Components

Inverters in here- (Air-Cond. fitted)

Junction Boxes

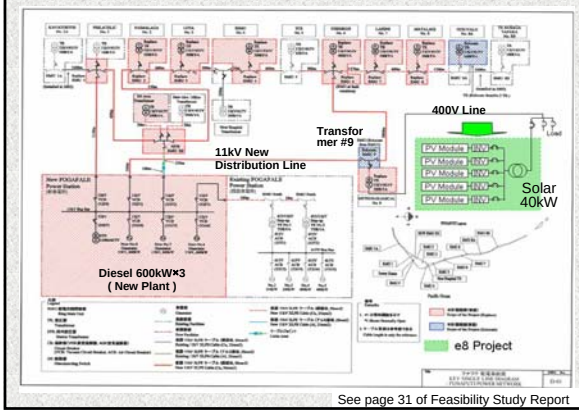
3xInverters [Interior walling with 3/8' plywood]

Transformer-Connection at LV side

Junction Box

1. 400volts cable length from project site to transformer – 360mtrs
2. Roof area covered by Panels – 282m²

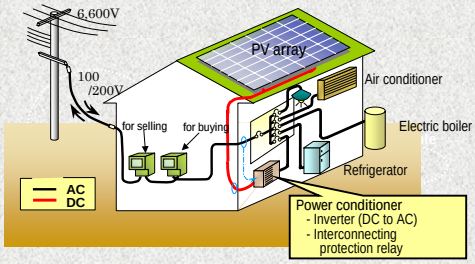
TEC's Power Grid System



See page 31 of Feasibility Study Report

Solar System in Japan

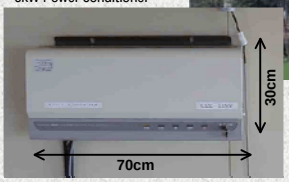
- Small power conditioner for grid connected solar house
  - Load of Solar home is AC, power conditioner include inverter.
  - For grid connection, some protection relays are installed in power conditioner. (such as anti-islanding system)
  - No battery (Because grid power can be used in the night)



Solar System in Japan

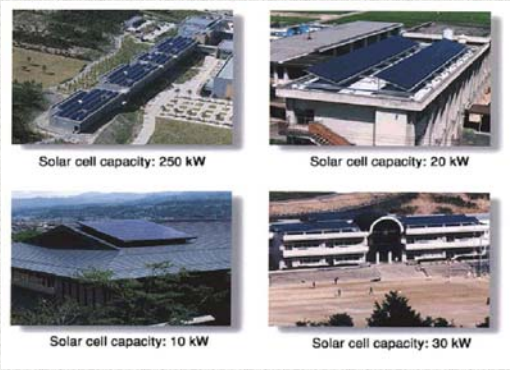
- Typical Solar System in Japan

5kW Power conditioner



Solar System in Japan

Large Scale Roof Top Solar Power Station

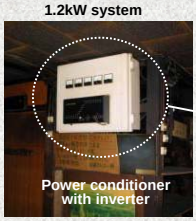


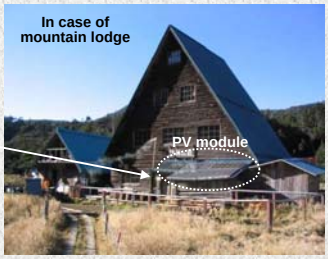
Solar System in Japan

Small power conditioner for Solar house (Non grid)

- Load of Solar home is AC, power conditioner include inverter.
- Function is same as full spec power conditioner but capacity is small. about 3 to 5 kW for one house.

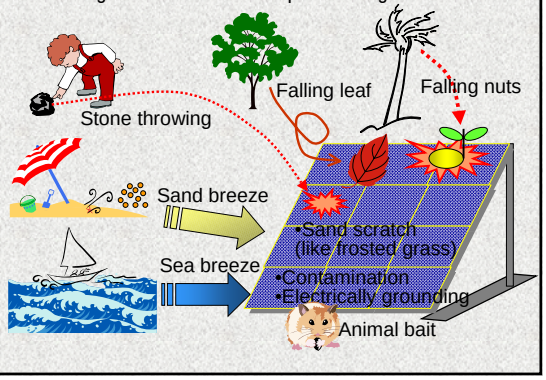
1.2kW system





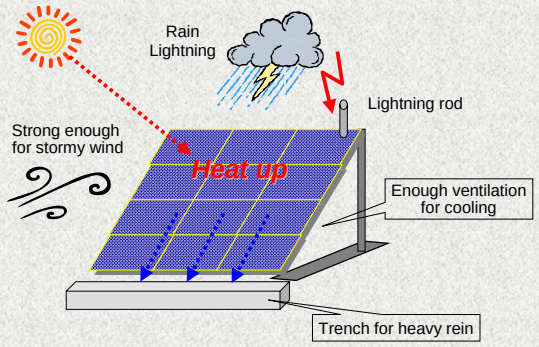
Some tips for system design

- Surrounding environment and anticipated damage



Some tips for system design

- Surrounding environment and anticipated damage



Thank You

Inauguration Ceremony Party
Time- Lunch at Vaiaku Lagi
Hotel

Village Solar Lighting Project

PROBLEMS

- Difficulties of Logistics
- Peoples preparedness to accept the project
- People's inconsistency in monthly payments (threat to sustainability & Replication)
- Local market for SHS products very expensive
- Overseas supplier not genuine

Village Solar Lighting Project

OPERATIONAL

- Come under Western Province sustainable Power Company
- Arrange with Microfinance to do monthly collections
- Provide technical back up service in Daru

Village Solar Lighting Project




Village Solar Lighting Project



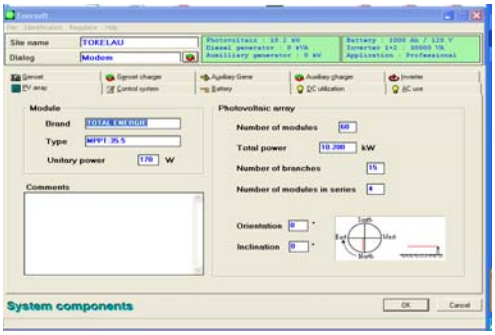


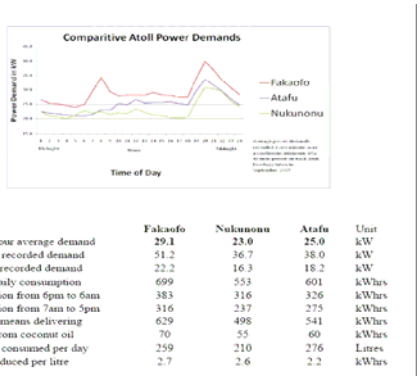
THANK YOU

INTRODUCTION

1. PROJECT TITLE: TOKELAU PV SOLAR HYBRID SYSTEM
2. HOW THE PROJECT WAS STARTED
3. PROJECT COORDINATION
4. DONORS INVOLVED
5. PROJECT IMPLEMENTATION
6. PROJECT COSTS
7. PROJECT COMMISSIONING.
8. TECHNICAL OPERATION
9. PROBLEMS OCCURRED DURING OPERATIONAL PERIOD
10. HOW WE ADDRESSED THESE PROBLEMS
11. CONCLUSION/RECOMMENDATIONS

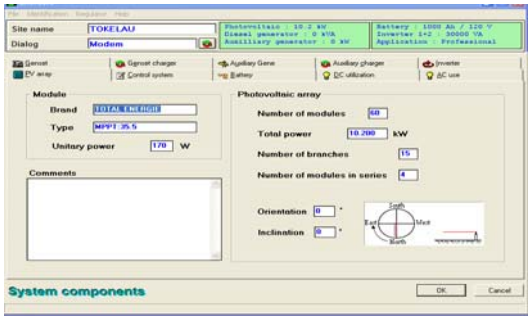
SYSTEM SPECIFICATION



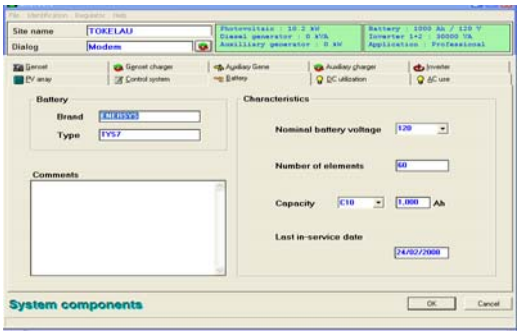


	Fakaofo	Nukunonu	Atafu	Unit
Total 24 hour average demand	**29.1**	**23.0**	**25.0**	kW
Maximum recorded demand	51.2	36.7	38.0	kW
Minimum recorded demand	22.2	16.3	18.2	kW
Average daily consumption	699	553	601	kWhrs
Consumption from 6pm to 6am	383	316	326	kWhrs
Consumption from 7am to 5pm	316	237	275	kWhrs
90% solar means delivering	629	498	541	kWhrs
and 10% from coconut oil	70	55	60	kWhrs
Litres fuel consumed per day	259	210	276	Litres
kWhrs produced per litre	2.7	2.6	2.2	kWhrs

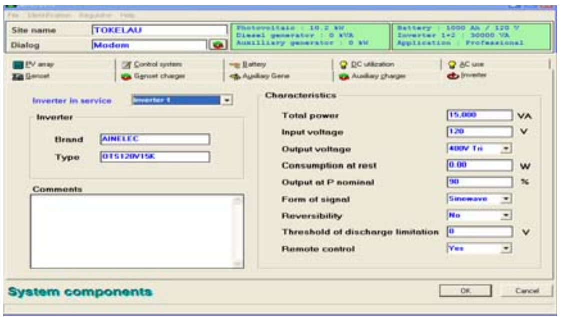
PV ARRAY



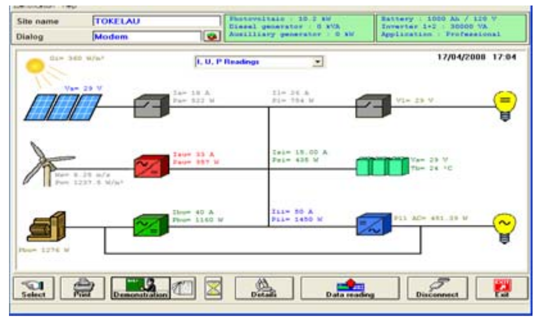
BATTERY



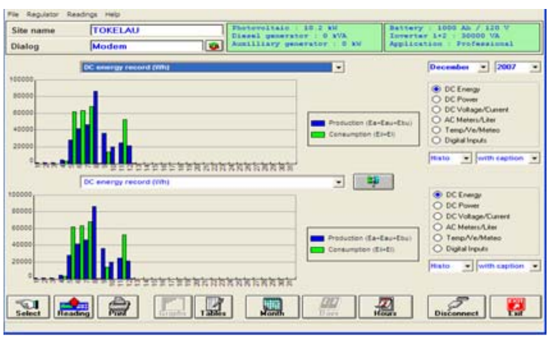
INVERTER



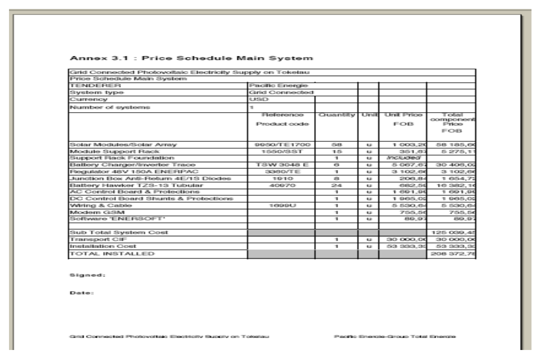
DEMONSTRATION



ENERGY RECORDING



PRICE SCHEDULE MAIN SYSTEM



Annex 3.1 : Price Schedule Main System

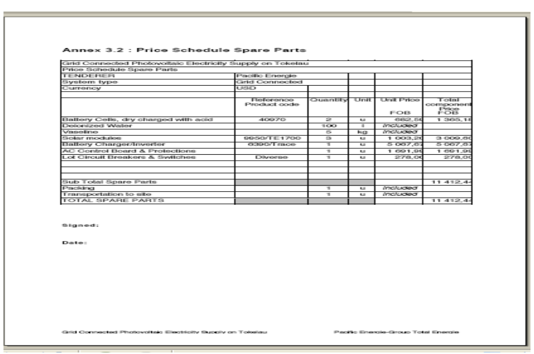
Grid Connected Photovoltaic Electricity Supply on Tokelau					
Price Schedule Main System					
TENDERER	Pacific Energie				
System type	Grid Connected				
Currency	USD				
Number of systems	1				
	Reference Product code	Quantity	Unit	Unit Price FOB	Total component Price FOB
Solar Modules/Solar Array	9950/TE1700	58	u	1 003,20	58 185,60
Module Support Rack	1550/SST	15	u	351,67	5 275,11
Support Rack Foundation		1	u	*included*	
Battery Charger/Inverter Trace	TSW 3048 E	6	u	5 067,67	30 406,02
Regulator 48V 150A ENERPAC	3360/TE	1	u	3 102,66	3 102,66
Junction Box Anti-Return 4E/1S Diodes	1910	8	u	206,84	1 654,72
Battery Hawker TZS-13 Tubular	40970	24	u	682,59	16 382,16
AC Control Board & Protections		1	u	1 691,99	1 691,99
DC Control Board Shunts & Protections		1	u	1 965,02	1 965,02
Wiring & Cable	1699U	1	u	5 530,64	5 530,64
Modem GSM		1	u	755,56	755,56
Software 'ENERSOFT'		1	u	89,97	89,97
Sub Total System Cost					125 039,45
Transport CIF		1	u	30 000,00	30 000,00
Installation Cost		1	u	53 333,33	53 333,33
TOTAL INSTALLED					208 372,78

Signed:

Date:

Grid Connected Photovoltaic Electricity Supply on Tokelau   Pacific Energie-Group Total Energie

PRICE SCHEDULE SPAR PARTS



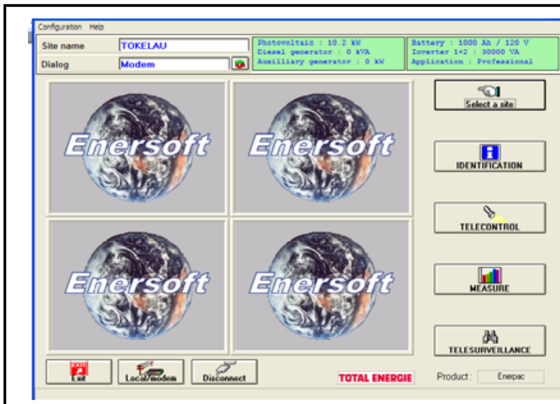
Annex 3.2 : Price Schedule Spare Parts

Grid Connected Photovoltaic Electricity Supply on Tokelau					
Price Schedule Spare Parts					
TENDERER	Pacific Energie				
System type	Grid Connected				
Currency	USD				
	Reference Product code	Quantity	Unit	Unit Price FOB	Total component Price FOB
Battery Cells, dry charged with acid	40970	2	u	682,59	1 365,18
Deionized Water		100	l	*included*	
Vaseline		5	kg	*included*	
Solar modules	9950/TE1700	3	u	1 003,20	3 009,60
Battery Charger/Inverter	6390/Trace	1	u	5 067,67	5 067,67
AC Control Board & Protections		1	u	1 691,99	1 691,99
Lot Circuit Breakers & Switches	Diverse	1	u	278,00	278,00
Sub Total Spare Parts					11 412,44
Packing		1	u	*included*	
Transportation to site		1	u	*included*	
TOTAL SPARE PARTS					11 412,44

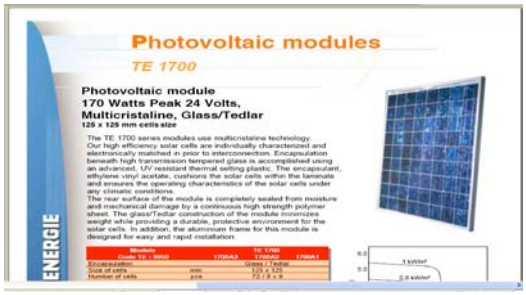
Signed:

Date:

Grid Connected Photovoltaic Electricity Supply on Tokelau   Pacific Energie-Group Total Energie



PV SOLAR PANEL



TYPE OF BATTERIES

TECHNICAL SPECIFICATIONS
solar modules/solar arrayand inverters

5.1. Solar Modules/Solar Array

The solar array comprises 58 Total Energie TE 1700 solar modules. Each module is rated at 170 peak watts.

TE 1700 m solar modules are polycrystalline and feature high output 'Q' cells and TYCO pre-wired inter-module connections to simplify installation.

TE 1700 modules, manufactured by Total Energie, are encapsulated with glass and Tedlar. Module frames are constructed with anodized aluminum.

Pacific Energie has installed identical or similar modules throughout the region.

Please refer to detailed Specifications in Annex.

5.2. Inverters

The Trace SW 3048 E Series sine wave inverters proposed are standard components in a typical configuration with two groups of three inverters operating in three phase.

These are 'off the shelf' inverters which require no modification. Replacements and spare parts are readily available.

Trace Xantrex is a recognized leader in the manufacture of inverters.

Pacific Energie has installed identical or similar Trace inverters throughout the region and particularly in New Caledonia.

Please refer to detailed Specifications Annex.

BATTERY BANK/SUPPORT STRUCTURE

5.3. Battery Bank

The battery proposed is a Hawker TZS 1300 series lead acid, tubular positive plate battery composed of 24 2 volt elements.

Hawker (Oldham) batteries of this type are used extensively in the Pacific region, notably in Tonga, Kiribati, New Caledonia, Polynesia, Vanuatu, the Marshall Islands and the FSM.

Pacific Energie has installed identical or similar Hawker batteries throughout the region.

Please refer to detailed Specifications in Annex.

5.4. Support Structure

The support structure proposed is a standard Total Energie design for use in tropical regions subject to high winds and corrosive atmosphere.

All components are made of anodized aluminum and stainless steel.

Pacific Energie has supplied and installed identical or similar structures extensively in New Caledonia and Vanuatu, notably for grid connected solar generators and large-scale community solar powered water pumping systems.

Please refer to detailed Specifications in Annex.

REGULATOR

5.5. Regulator

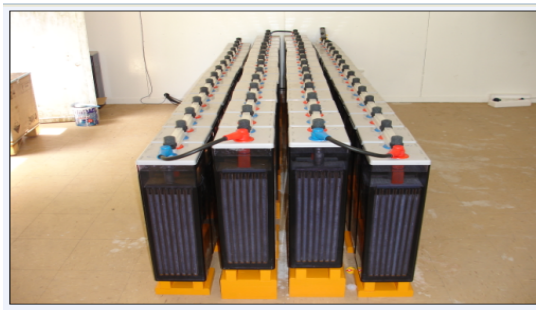
The Total Energie ENERPAC 48 volt 150 amp regulator is a standard product which is used extensively by Pacific Energie and all other Total Energie subsidiaries.

This regulator is designed to facilitate the operation and management of hybrid installations incorporating solar photovoltaics, thermal, wind and hydro power.

The ENERPAC regulator data logger is incorporated in all utility grade regulation and control systems supplied and installed by Pacific Energie for power utilities in New Caledonia.

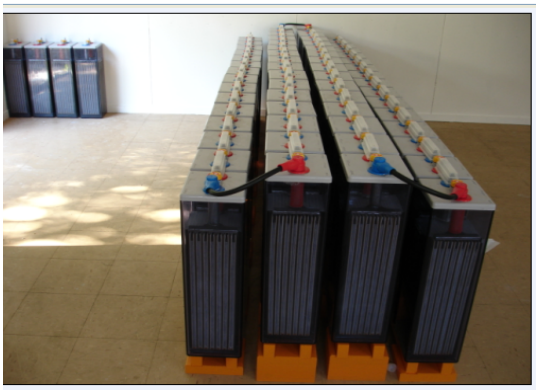
Please refer to detailed Specifications in Annex.

Battery Bank

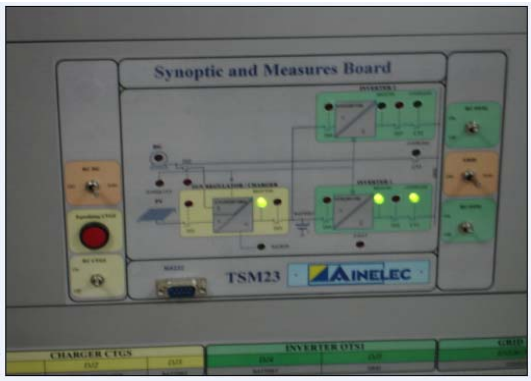


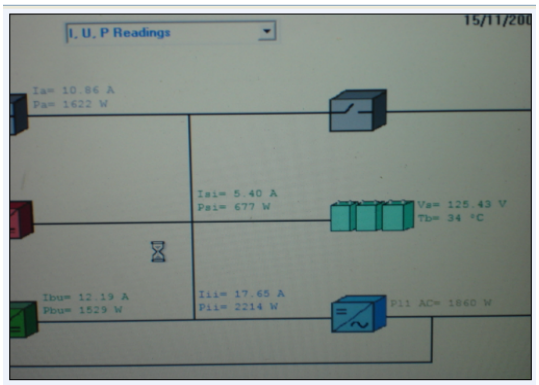
Solar Array

SOLAR ARRAY STRUCTURES



INSTALLATION OF CONTROLS

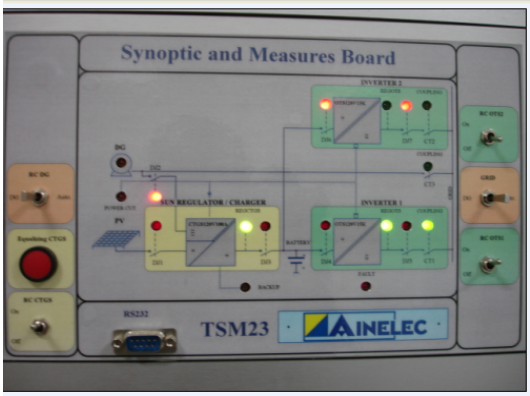

Synoptic and Measures Board
TSM23
AINELEC


I, U, P Readings
Ia= 10.86 A
Pa= 1622 W
Isi= 5.40 A
Psi= 677 W
Va= 125.43 V
Tb= 34 °C
Ibu= 12.19 A
Pbu= 1529 W
Iii= 17.65 A
Pii= 2214 W


y to useful places.


nputer.


Stopfile



PROBLEMS

- 1. Non Technical Problems
- a) Communication Problems
- b) Contractual Problems
- c) Lack of Training
- d) Vandalism
- 2. Technical Problems.
- a) System Breakdown
- b) Faulty Charger Units
- c) Malfunction Data Logger

CONCLUSION/RECOMMENDATION

- 1. System Works Satisfactory
- 2. Training of staff
- 3. When decide for expansion of system, we need the right people to deal with in terms of design of system, installation and training of staff.
- 4. Plan for expansion of system
- 5. Way Forward

The National Energy Policy and Strategic Action Plan (NEPSAP) for Tokelau includes the goal of energy independence through the use of 100% renewable energy. Generally, the plan includes the development of two indigenous resources found in relative abundance in Tokelau and elsewhere in the Pacific. These are firstly, sunshine, using photovoltaic technology to generate electricity and secondly, coconut oil for direct replacement of petroleum-based diesel fuel. For the purposes of this consultancy, it is presumed that the electricity generation capacity will be derived from a mix of 90% solar PV with the remaining 10% made up by coconut oil.

Successful implementation of technology in a sustainable manner, especially in remote, isolated places, requires not only adequate engineering and technical efficacy, but a management and institutional infrastructure that is capable of maintaining the socio-economic benefits the technology is to convey. The methodology used through the course of this consultancy is designed to ensure that this is the case by identifying the symptoms contributing to system failure before they are beyond the control of the management systems currently in place. This way, the benefits of the proposal may be enjoyed and the project replicated downstream.

- THANK YOU AND
- FAKAFETAI LAHI LELE

Biogas

AMATUKU BIOGAS PROJECT

Presentation Prepared by the Alofa Tuvalu Team

Presented by Mafalu Lotolua

For further details please contact:

gilliane@alofatuvalu.tv and sarah.hemstock@thembatrust.org.uk

1

OVERVIEW OF PRESENTATION

- Introduction to the Alofa Tuvalu Small Is Beautiful Project
- Tuvalu's problems & solutions
- Criteria and Objectives for RET's in general and project activities in particular
- Concrete actions in Tuvalu & support for these actions
- Piggery & Digester in detail…
- The future of RET's in Tuvalu – potential and plans

2

Who is ALOFA TUVALU?

- Non Government Organization based in France
- Initially started in 2004 –their first visit
- Currently has a membership of 400 locals
- Vocal in lobbying Tuvalu Threatened Status as a result of sea level rise caused by climate change
- Nationally recognized - Local coordination unit established
- Member of the Tuvalu Energy Working Group in the formulation of the Energy Policy and the Strategic Action Plan

3

WIDER PROJECT OVERVIEW :

BIOGAS in Tuvalu, is one of 7 activities developed for the Tuvalu National Renewable Energy Demonstration and Training Centre project - AMATUKU The Centre itself, is part of a decade long plan, The "Small is Beautiful" (SIB) program, one of UNESCO's Decade of Education for Sustainable Development Remarkable Actions.

SIB's Primary Objective is to assist Tuvalu survive as a nation.
This can be achieved by a combination of:-
• Reduction of greenhouse gas emissions and raising awareness of other sustainable solutions by fully implementing and duplicating SIB - an environmentally exemplary nation model for Tuvalu.
• Planning for the worst case scenario: identifying a new homeland where the nation of Tuvalu can be resettled and where Tuvaluans can live with their cultural and traditional uniqueness intact.

4

SIB progress so far…

2004
The first essential step - Tuvalu's people and Government pledged support for and participation in activities for Tuvalu's sustainable development.

2005
Alofa Tuvalu team reconnaissance mission to Tuvalu.
Community participation in project planning events.
Promotion of family gardens.

2006
Publication & Cabinet presentation of the « Alofa Tuvalu Renewable Energy study » by Sarah Hemstock and Pierre Radanne (biomass, wind and solar specialists).
The study's main recommendation, The Amatuku Renewable Energy training Centre, was discussed in Parliament.
Further community meetings were held and a "Master Plan" was developed in full consultation with GOT - partnership agreements obtained from 16 Tuvalu & GOT departments & organisations (including TMTI).

2007
Construction of biogas plant and piggery at Amatuku completed.

5

Tuvalu's Problems – outlined in the 2006 Alofa Tuvalu RE Study

- A weak economy · *The weight of imports- Lack of exports*
  In 2003, the exports represented 147.000 aus$ compared with 24 Million aus$ for imports. There is a great imbalance since imports are 160 times greater than exports!!!!
  This situation is unsustainable and will collapse in the short term.
- A difficult agriculture – poor soil, low production, salt contamination.
- Waste management problems - population of 360 inhabitants per km² (and 1600 in Funafuti);
- Oil dependent economy – increase in oil price, oil fields drying up so no long term future.
- Geographical isolation – import of goods is expensive
- All these problems degrade the environment.

6

Tuvalu's Solutions –
outlined in the 2006 Alofa Tuvalu RE Study

The majority of Tuvalu's imports are food & oil so we should look at food production in Tuvalu & reduction of oil imports.

How?

By using Tuvalu's natural resources:-

✓ Solar (PV & solar thermal), Wind, & Biomass (coconuts, charcoal, and organic waste).

✓ Turn waste to energy & compost (biogas digester & gasification technology).

✓ Use compost to grow food (family garden programme).

Also: REDUCE NEED: Energy efficiency, recycling packaging & reducing plastic packaging.

7

Renewable Energy for Tuvalu

Trends in energy use reveal several priorities for Tuvalu's energy policy:-

- To increase and modernise the thermal uses of renewable energy resources – biomass (digestion & gasification), solar thermal,
- To promote renewable energy sources for electricity generation - biomass (digestion & gasification), wind, solar PV,
- To reduce the dependency on imported oil for transportation (biomass – coconut oil biodiesel).
- And, in all cases, to reduce use by improving energy efficiency.

8

Criteria to develop renewables for sustainable development in Tuvalu

- To decrease oil currency outflow, and generally avoid imports.
- To contribute to the development of the whole country.
- To seek the cheapest cost possible for inter-island transportation and for freight imports.
- To find a solution for waste and sewage; to protect environment and health and to enrich the soil with compost.
- Choose proven technologies with lower running and maintenance costs.
- To build capacity within Tuvalu for operation, maintenance and repair of any implemented renewable energy technology (Tuvalu National Renewable Energy Demonstration and Training Centre – AMATUKU)
- And of course, to contribute to reduce greenhouse gas emissions and to the PIGGAREP Project. *Sustainable biomass use does not contribute to climate change.*

9

Criteria for development of Tuvalu National Renewable Energy Demonstration and Training Centre - AMATUKU

- Training was identified by Tuvaluans as the most needed intervention to ensure the sustainability of project activities.
- Isolation means that repair and maintenance are extremely costly and time consuming unless capacity is developed locally. Many past projects have failed for this reason.
- Self-sufficiency is a prerequisite.

Conclusion:

Training and substantial capacity building are crucial to address the above sustainable development constraints. Therefore the RE Centre at TMTI Amatuku is key to the SIB projects wider success.

10

Objectives of the Tuvalu National Renewable Energy Demonstration and Training Centre - Amatuku

The overall objective in Amatuku is to provide an ongoing demonstration facility where:-

- All Tuvaluans may come to learn and get hands on training in renewable energy technologies in order to spread their use throughout Tuvalu.
- People trained at Amatuku will become instructors & promoters in their own communities to pass on their new knowledge.
- Community members will also be trained as technicians for basic systems maintenance and repair.
- A valuable training resource for Tuvalu Maritime Training Institute students.

11

In Tuvalu: Concrete Actions & Support

i) A piggery for 40-50 pigs and biogas digester (8m3) for the pig waste was built in 2007 at the Amatuku site.

ii) 4 people have been fully trained in the construction of biogas digesters.

iii) 4 workshops have been held on construction, operation & maintenance with a total number of 198 attendees, (60% were women and 10% were selected TMTI students). Women were targeted initially as they are the main users of domestic energy. These workshops have been supported by daily radio energy awareness broadcasts which lasted for 5 months.

iv) This was the first digester to be built on a coral atoll and specific technical issues had to be dealt with and lessons learnt.

v) Technical support was received from overseas scientists supported by Alofa Tuvalu.

vi) A construction engineer was supported by SOPAC and Alofa Tuvalu.

vii) In-kind support for construction and design of the piggery was received from several Tuvaluans, and an ongoing partnership agreement is in place with TMTI who provide considerable help with transport of people & materials to Amatuku.

12

Training Workshops

13

Training in Construction

14

Stages of Construction

15

Difficulties - construction

The digester could not be fully submerged underground because of difficulties digging through the coral – the water-table was high. The top 1m of the final digester would be above ground. The depth the digester could be buried was 1.6m – normally a digester of this size is buried to a depth of 3m.

Initially, there were also problems with rainwater infiltration of the main digester chamber.

16

Difficulties - construction

Even though the depth was only 1.6m, the high-tide infiltrated the bottom of the digester, so this meant that the base of the digester had to be sealed.

Base of digester

Seawater infiltration at high tide

17

Difficulties - transportation

All materials had to be transported from Fiji to Tuvalu then from Funafuti to Amatuku – this added to the cost of the project considerably. Construction workers and workshop participants also needed to be transported to Amatuku.

18

Problems Faced by the Project




Farmers prefer to use their pig pen

Rainwater Infiltration of digester during rainy days

- Problems associated with building on a coral atoll with low water table
- Digester could not be completely buried-base had to be sealed.
- Logistics of importing materials were problematic due to isolated location off site of the main island Funafuti
- Rainwater infiltration of digester during rainy days through the drain.
- Low number of pigs-caused low gas level in digester
- Farmers prefer to keep pigs in their own pig pen, only one unit for all their pigs.
- No permanent worker to look after the project-to ensure not to use too much water for cleaning pig pen.

19

Application of the energy services

The methane produced by the digester will be used:

- as cooking fuel for the needs of a community kitchen,
- and for the TMTI students' kitchen,
- provide lighting around the piggery.

The compost produced (important in Tuvalu where arable land is on the decline both in quantity and quality due to sea water contamination), will be used to grow vegetables for consumption by TMTI staff & students.

The majority of sewage (human & animal) throughout Tuvalu goes into the sea or lagoons. The use of digesters will promote cost-effective sanitary waste disposal and prevent untreated slurry entering the environment.
Community lighting around the piggery.

The piggery provides sanitary housing for the pigs and prevents environmental contamination by waste from the pigs.

20

Wider Community Benefits from the Activity

- Reduction in GHG emissions (from substitution of kerosene & LPG and reduction in methane entering atmosphere).
- Reduce environmental pollution (less animal slurry entering environment, reducing outdoor and indoor air pollution). Preventing water contamination, sewage decontamination & waste disposal.
- Animal welfare benefits – improved housing for animals.
- Benefits for human health and surrounding ecosystems.
- Increased energy security and self sufficiency.
- Increased food security.
- Compost and fertilizer – ameliorate and/or replace salt contaminated soil.
- Increased agricultural production (vegetable gardens and livestock rearing).
- Income from sale of vegetables, pigs, and gas – increased household income.
- Training resource for TMTI students & the wider community - education.
- Operation and maintenance facility for other implemented RET's.
- Strengthen Tuvalu's case in climate change negotiations.
- Gender equality, good governance and improve livelihoods for women; Women's groups have been targeted.

21

Project Evaluation

- A monitoring committee of representatives from each stakeholder group was established in 2007. Project goals , targets & evaluation will be set by this committee.
- Alofa Tuvalu & the GoT will be responsible for reporting to funders and publishing results on monitoring findings, budgeting, accounting. A financial audit will be undertaken at the end of the first 2 years.
- The committee will track progress against the agreed verifiable indicators, along with project schedule and project budget.
- In order to assess project progress, base line information will be collected, including:
  - Socio-economic data (participation by gender, income, livelihoods, housing, energy service availability & cost)
  - Present land use (coconut, taro & other agricultural productivity)
  - the range of vegetables grown at present and their market values
  - Environmental indicators (soil quality & quantity, biodiversity
  - sustainable use of natural resources, carbon & energy balances, water quality & consumption, chemical inputs & runoff, land quality, air quality
  - avoided air pollution from combustion of waste & traditional biomass
  - Diet & general health (sanitary hot water, unsanitary conditions & pollution)

This information will be used as a base-line guide to measure the real effectiveness of the project interventions

22

Wider Amatuku RET Centre Budget

- Over the 48 months of the action, the global amount estimated for the 7 main activities of the Action is around 1,000, 000 euros.
- The budget has been calculated with rates obtained by consultants and specialists who accepted to work for less than their usual rates because of their interest in the project. Most of them leave their pay in the NGO to allow the project to go on.
- Furthermore putting a value to the Tuvaluan participating de facto in the implementation is too great to be estimated.

23

Construction Cost

No	Description	Cost (AUD$)
1	Digester	
	Digester materials	4,400
	Construction Workers	4,000
	Shipment and Customs Fees	4,450
	Construction Specialist-Wages and Per diem	4,000
2	Piggery	
	Materials and Workers	24,500
	Shipment	13,350
	Construction specialist wages and Per diem	4,000
	TOTAL	$ 58,700

Cost would be considerably reduced if material can be found on location or transported on a national vessel. Furthermore China will soon put on the market family digesters for around 300 Aus$.

24

Funders/Partners & team

The Amatuku Micro Model began implementation with the support of :-

i) ADEME (French Energy Management Agency)
ii) French Foreign Affairs in partnership with the Government of Tuvalu
iii) TMTI (Tuvalu Maritime Training Institute).

Amongst other partners for the first construction:
SOPAC (Pacific Islands Applied Geosciences Commission) with PIEPSAP funds.

Apart from the partners mentioned above, the communication campaigns and tools on climate change created by the association, in France, stirred up the interest of most of the actors concerned with climate and environment protection (ONERC, RAC/CAN, Greenpeace, WWF, the foundation Nicolas Hulot, Good Planet, Friends of the Earth...). Their assistance doesn't translate necessarily into finance but are of great value. So is the support from Unesco and the European Commission.

Much work communicating Tuvalu's situation has been done internationally via various events and the production of a comic book – OUR PLANET UNDERWATER - for school children, now translated into 7 languages.

25

Renewable Energy for Tuvalu

If implemented, SiB would provide Tuvalu with the practical means of fulfilling GoT's energy policy and of respecting its commitments to international climate change resolutions by abating GHG production. In addition, it would also :-

- strengthen Tuvalu's case in regional and international climate change negotiations,
- reduce its dependence on imported oil, decrease oil imports and provide Tuvalu with increased protection from the whims of the international market,
- increase the amount of domestically produced food while decreasing the amount of waste and the volume and cost of food imports,
- reduce pollution and run-off, preventing land, sea, and groundwater contamination.
- replace soil in areas where it is heavily impacted by salt contamination,
- provide income and much needed jobs, improving quality of life in the outer islands and thereby contribute to the reduction of migration to Funafuti and reduce the environmental impacts of high population density, and thus improving the well-being of Funafuti as a whole.

26

Objectives of the Tuvalu National Renewable Energy Demonstration and Training Centre - Amatuku

As SiB expands into a nation-wide program:

- The Amatuku micro-model will become a central national maintenance and training centre.
- The RE Centre will form part of TMTI's ongoing development.
- The RE Centre will support smaller maintenance facilities and community technicians on the outer islands.
- It will also become an example for other SIDS and nations.
- Provide income generating opportunities for the school, communities and individuals
- Provide a training resource for TMTI staff & students, the wider population of Tuvalu & the region.

27

Thank You

28

Tour of biogas, gasifier and solar PV projects

Solar Water Pumping

SIS Capacity Building Workshop on Renewable Energy Technology Applications
Melanesian Hotel, Port Vila, Vanuatu
21 – 25 April, 2008

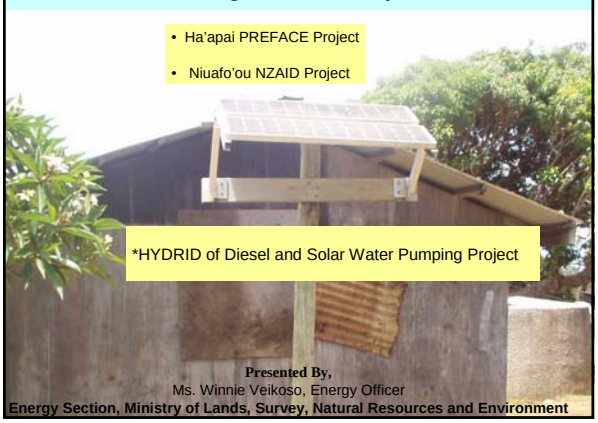
Working together to renew the Pacific's future

PIGGAREP

GEF

TOPIC: *Tonga solar PV experiences*

- Ha'apai PREFACE Project
- Niuafo'ou NZAID Project

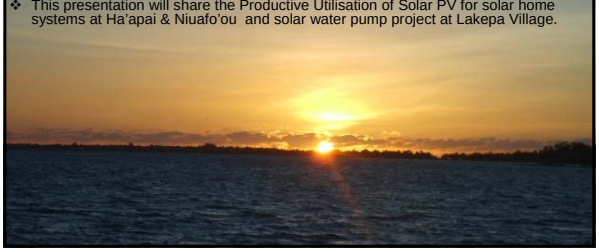


*HYDRID of Diesel and Solar Water Pumping Project

Presented By,
Ms. Winnie Veikoso, Energy Officer
Energy Section, Ministry of Lands, Survey, Natural Resources and Environment

Introduction:

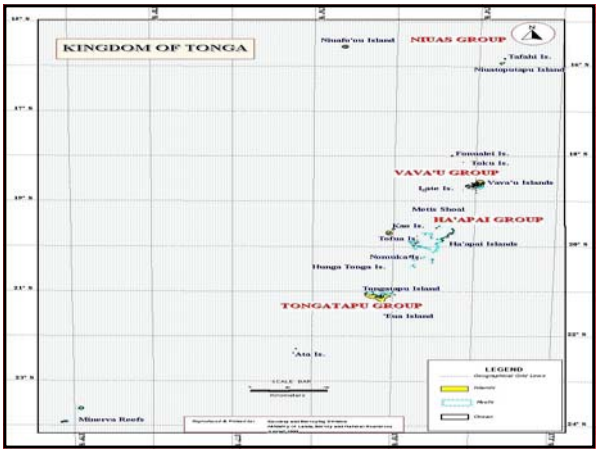
- Tonga has been experience with RE project (mainly solar home system) since the late 80s and those experiences was mostly lighting.
- From the 80s to current Solar PV System has been used in the country for lighting, water heater and water pumping.
- This presentation will share the Productive Utilisation of Solar PV for solar home systems at Ha'apai & Niuafo'ou and solar water pump project at Lakepa Village.



Lakepa Diesel and Solar Water Pumping Project

PREFACE Project at 'O'ua, Ha'apai

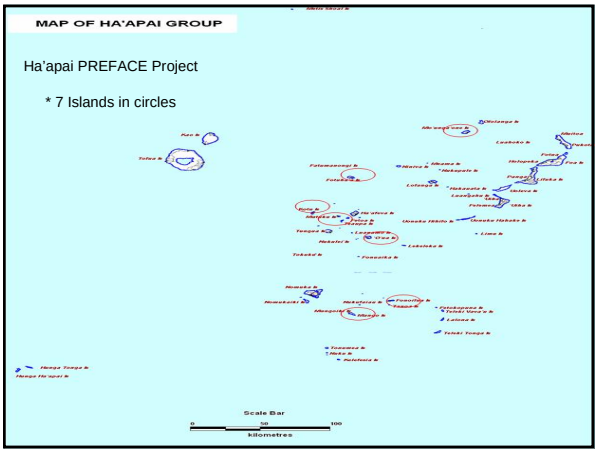
QSC (Boarding) Solar Water Heater

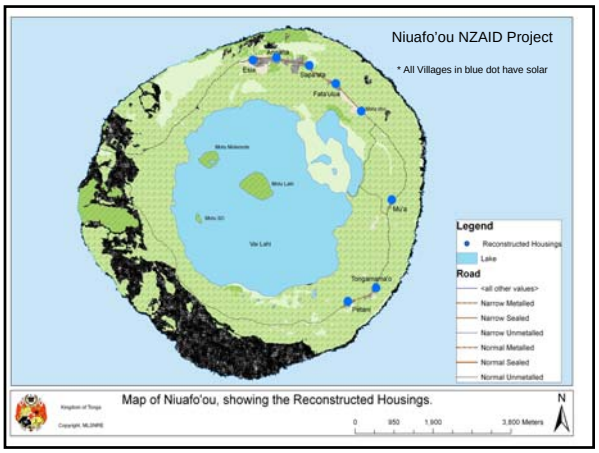


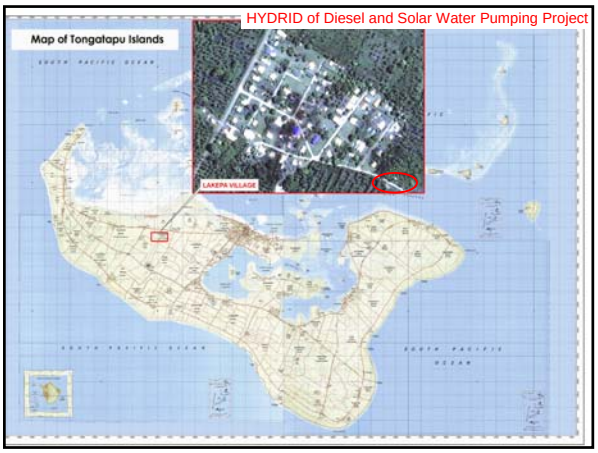
MAP OF HA'APAI GROUP

Ha'apai PREFACE Project

* 7 Islands in circles







Background

Lighting: Ha'apai PREFACE Project and Niuafo'ou NZAID Project

- PROVIDE RELIABLE, AFFORDABLE, AND ENVIRONMENTALLY SOUND ENERGY SOURCE AND TO REDUCE THE DEPENDENCY ON IMPORTED FOSSIL FUELS. PROVIDE BETTER STANDARD OF LIVING FOR ISLAND COMMUNITIES.
- TOTAL 340 SHS FOR HOUSEHOLDS, CHURCHES, SCHOOLS, COMMUNITY HALLS AND STORES.
- DISTRICT INCORPORATE SOCIETIES ESTABLISHDED TO MANAGE THESE PROJECTS, AND ARE JOINTLY MANAGING WITH EPU AND NZODA THROUGH STAFFING, ONGOING MONITORING & MAINTENANCE ACTIVITIES.

Hybrid Solar water pump with Diesel: Lakepa Village

- Lakepa is one of the smallest villages to the western site of Nuku'alofa in the main land of Tongatapu with about 51 household and 320 population (1996 Census). The main income of the Lakepa village is farming and selling handy crafts.
- Tap water have been introduce to the village start with a diesel water pump in the 1960s (302 pop,51 households). The money for the project was raised by the villages.

Hybrid Solar water pump with Diesel: Lakepa Village

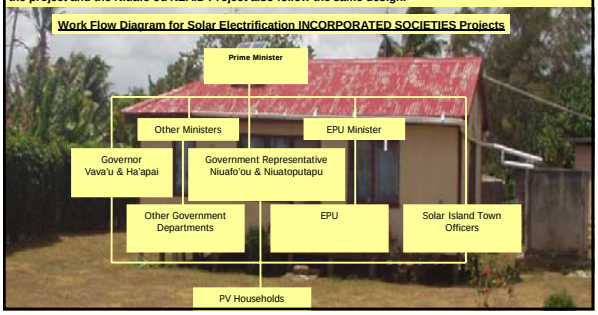
- In the 1980s (368 pop, 54 households) aid from the Government of Netherlands through the Government of Tonga(GOT) donated a new whole system in a different drilling water system from the first water system.
- In 2007, the GOT again through the aid from the government of Japan donated a whole new water pumping system with a hybrid of solar system.
- Therefore the village now own and used three water tank, one diesel machine and 8 solar panel that hybrid with diesel.

The technical, institutional and financial design of the project

Lighting: Ha'apai PREFACE Project and Niuafo'ou NZAID Project

Institutional Design:

The PREFACE project first introduce the cooperative society system to owned and run the solar home system projects. The diagram provided shows the technical and institutional and financial designing of the project and the Niuafo'ou NZAID Project also follow the same design.

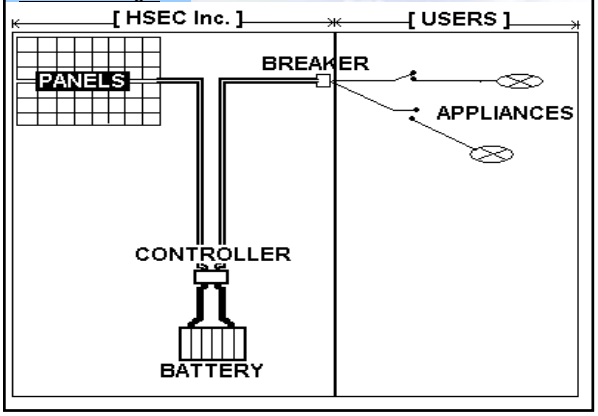


Financial Design:

Lighting: Ha'apai PREFACE Project and Niuafo'ou NZAID Project

- 60% of the annual revenue is set aside for future maintenance of the SHS while 40% is for the annual expenses of the Society, It is expected that this number would be switched in the near future particularly for HSES Inc.
- Monthly repayment per system is approximately US$8.00 and 20% covers wages of the island technician.
- In the first 4 years of HSES Inc. the percentage of fee collection had always more that 90% despite that fact that the fees being collected from the islands has always late due to remoteness of the islands and communication constraints. This is not the case in the Niuafo'ou NZAID Project.
- The Committee has never encountered any serious technical problem and every effort has put forward to prolong the life of the systems. However, it is expected that heavy burden of PV components high costs would probably occur after the 6th year. At the moment the management committee has set aside 20% of its maintenance funds to cover costs of controllers which is expected to have been out of operation.
- Continue……

Technical Design:



Technical Design (SHS)

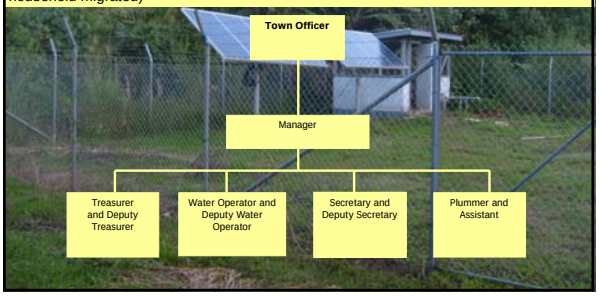
- 2 x 180 Watt Peak Panels
- 1 x 130 Ampere Hour, Deep Cycle, Tubular Plate, 12 Volts, Lead Acid Battery
- 1 x 25 Amps, 12 Volts Electronic Regulator
- 3 x 13 Watt Interior Light
- 1 x 13 Watt Exterior Light
- 1 x Night Light
- 1 x Radio Connection Devices

Institutional and Financial Design:

Hybrid Solar water pump with Diesel: Lakepa Village

• Lakepa water supply own by the village like any other village the village elected water committee (diagram below) and the water committee reported to the FONO – Village Meeting

• Total of 65 water meters installed (58 only currently used 7 meters is not used household migrated)



Technical Design:

The productive applications of the energy services provided by the project

Lighting: Ha'apai PREFACE Project and Niuafo'ou NZAID Project

- More than 90% of the fees were collected.
- Improvement in school children's education is expected to be seen in all the project site.
- More and more economic activities carried out in the households in both day and night
- Good quality lighting system for the households

Hybrid Solar water pump with Diesel: Lakepa Village

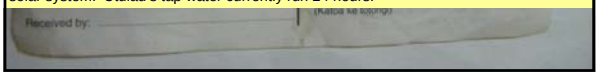
• Lakepa Water Committee proposed and approved by the Fono to follow the following rental cost.
  - ➢0 < 4000 liter pay TOP$4.00
  - ➢4000 > pay 1 seniti (cent) per liter

• Lakepa Water Committee collected 60% more revenue since they start using solar and 80% less expenses (Mainly administration cost only the committee is paying). The town officer happily reported since June 2007 they still using one drum of diesel, they do not know much about solar but definitely using solar make a very much different.

•Lakepa's tap water is running 24 hours since March 2007.

• Compare to 'Utulau Village Water Committee (100% diesel):
  - ➢0 < 15,000 liter pay TOP$10.00
  - ➢15,000 Liter > pay 10 seniti (cents) per liter

• 'Utulau Water Committee used one drum of diesel every three months with the payment above. 'Utulau Village still fully run by diesel and currently request to donors for solar system. 'Utulau's tap water currently run 24 hours.



Benefited of PV Solar System Project

SOLAR LIGHTNING:

- Experiences and ideas on the overall operational of the HSEC Inc. office was very important to be shared with the Niua technicians. One of those is the misusing of committee funds by the HSEC Inc. technicians. On another issue, some of the outer island technicians were not doing their job to prevent the systems from putting at risk. It is expected that the two issues will tabled in the 2005 HSEC Inc. Annual General Meeting. We have been able to visit the HSEC Inc. project sites in the outer islands and preventive maintenance was the main part of the training.
- Provide and improve lighting needs for the people of the remote island group . Thus improve the socio-economic benefits in the island community as well. Households can regularly turn on radios anytime throughout the day. A major reduction on junk dry cell battery is expected to be seen in the island community.

SOLAR WATER PUMP:

- People now have tap water and hardship of carrying water from the neighbour and various house work is efficient with own tap water at each household.
- Only one drum of diesel have been used by the water project of Lakepa for 10 months now
- Tap water of the village run 24 hours since the solar and diesel hybrid for the water pumping
- Standard of life of individual increase and hardships is minimised - more school student goes to town (from pre-school to tertiary).

Disadvantages of PV Solar System Project

SOLAR LIGHTNING:

- Committee job descriptions (mostly work is overlap and cause misunderstanding and confuse with the people)
- Lack of technical knowledge of the right way of using the system
- Ignorance (to pay the rental or report problems to the technician)
- Communication between the islands seemed to be the major obstacle to the operation of the Committee. The missing of hand-carried reports and cash from the islands.

SOLAR WATER PUMP:

- Lack of technical knowledge of the new system (solar PV)
- Meter donated was not safely installed and no training of how to read it.
- Still manually calculate meter bills take much time and usually not accurate that usually cause disappointments and stress
- Household turn to use tank water and not bother to use tap water again
- Rental cost was determine by the committee but with out any financial break down.
- Inactive of the water committee (mostly due to personal problem)

CONCLUSION:

❖ RE Project from SOLAR SYSTEM in the Kingdom indeed improve, enhanced and generate opportunities through health, clean water better education that improve quality of life of the rural and remote island of Tonga.

❖ Most importantly the RE Project improve quality of life and increase local resilience, self-reliance and reduce hardships.

❖ RE Awareness speak louder from projects (that worked out), as the PREFACE project of Ha'apai introduce a good format (technical, financial and administrative) to run the project and the same case happen to the Lakepa Water Committee.

Thank You!

Results from UNCDF Funded Solar Water Pump Project in Kiribati
KIR/87/C02
1989 - 1998

Presented by Terubentau Akura
(CEO KSEC LTD)
at
SIS Capacity Building Workshop – Vanuatu April 2008

Objectives

Development goals:

- **Improve the living conditions of people on outer islands**

Immediate Objectives:

- **Formulation of the National Master Water Plan**
- **Improvement the Capability of the Water Unit to design, construct, operate and maintenance water supply schemes; and;**
- **Implementation of the CDF assisted Community Water Supply Programme**

Budgets

US$1,400.00 – UNCDF (hardware, TA, installation costs)

Government paid salary for PWD Water Unit staff and Island Water Technician

Community contributed free labour

Outputs

1. 592 hand operated diaphragm pumps installed
2. 17 solar water pumps (1 horse power) installed in 14 communities and 3 secondary schools
3. 5 x 1/3 horse power solar pumps installed in secondary schools
4. 46 x 1/8 horse power installed in primary schools
5. 80 x 6 cubic metres capacity polyethylene tanks installed
6. 253 water wells with galleries constructed
7. 1,400 metres of polyethylene pipes laid

Problems

- Start Big
- TA and Driven
- Communication and remoteness of islands
- In-adequate skilled labour in the field
- Lack of budget for local staff transport costs
- Lack of maintenance and spare parts

Recommendations

• Further monitoring and evaluation is required on solar water pumping systems regarding reliability, durability and life expectancy
• Maintenance should be passed on to the Kiribati Solar Energy Company Limited
• Improve communication and co-ordination between PWD Water Unit and KSEC LTD and local community in technical design, installation and maintenance of solar water pumps and education of the community for the need to contribute for the cost of maintenance.
• impose a rural water tariff to cover the replacement costs of components

Future

- 2008 – 2013

  EDF10

  - 6 million Euros have been approved
  - KSEC LTD is negotiating with PWD Water Department to be involved in the technical design, specification, installation and maintenance
  - Community ownership

Thank you

Kam bati n rabwa

Biofuel

SIS Capacity Building Workshop on Renewable Energy Technology Application

PORT VILA 21 - 25 APRIL 2008

RENEWABLE ENERGIES

IN PARTNERSHIP WITH

THE GOVERNMENT OF VANUATU

AND

UNELCO SUEZ

OBJECTIVES

PMT Energies renouvelables

PMT ENERGIES RENOUVELABLES

	2007	2008	2009	2010	2011	2012	2013
Production Brute Totale MWh	59	62	64	66	68	70	71
Réglage % Coco à Tagabé		0,15	0,25	0,35	0,35	0,35	0,35
Nombre d'éolienne		2,2	11	11	19	19	19
Solaire (KWc installé		50	100	150	200	250	300
G3 Coco 100%							
G4 Coco 100%							
En %							
Cocofuel Vila	1,5	4,9	7,6	10,4	10,1	15,3	15,0
Eolien Vila (11 machines en 2010)	0,7	2,0	9,6	9,3	15,6	15,2	14,8
Cocofuel Malicolo			0,9	0,9	0,9	0,9	1,0
Hydo Santo	5,6	4,8	8,0	9,1	8,8	8,6	8,4
Total	**7,8**	**11,9**	**26,3**	**30,0**	**35,9**	**40,6**	**39,8**

MEANS TO BE USED

Solutions

- Coco-fuel
- Wind Energy
- Biomass
- Geothermal
- Hydro
- Solar





Use of Coco-Fuel IN 4 Mgwh Generator at Tagabé

- Nov. 2005 to Oct.2006 : 5% mix for 40 litres/hour
- Nov. 2006: 10% mix for 80 litres/hour
- July 2007 : 15% mix for 120 litres/hour
- April 2008: 25% mix for 200 litres/hour

BIO-DIESEL

Developing Rural electrification

Make Communities Responsible

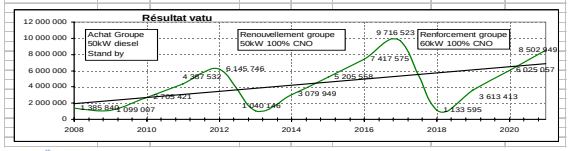
Introduce Appropriate Management Practices

Viabilité - Business Plan

Simulation de résultats Financiers sur 10 Ans

Variables				Résultats	
Prix Vente kWh H.T	85	Prix Gas Oil	240	Qté Brancht avec Fonds	37
Type Consommations		Prix Huile Coco	60	kwh/mois/Petit Consom.	6
Village Coutumier C1		% Diesel	4%	Facture TTC Vt/mois	574
Village Rural C2	X	Provision. Répar		kwh/mois/Magasin Rural	20
Croissance kWh	5%	Fonds Brcht Vt/kWh	1	Facture TTC Vt/mois	1 874
Heures / Jour	14	Frais Financ.	5,0%	kwh/mois/Gros consommateur	113
Prov. Renouvelt	oui	Frais assistance	5%	Facture TTC Vt/mois	10 844
Pointe kW	26	Tonnes Coprah/an	41,5		
Conso moyenne kWh	13	Litres huile /an	24 896		
Puissance installée	**40 kW**	**Capacité Huilerie**	**80kg/h**		
Foyers	288	Huilerie	5kW		
Ecole primaire	2	Pecherie	2kW		
Pompage	2,2kW	Boucherie	1,5kW		

Les Chiffres sur 10ans		
Cumul Renouvellement	41%	8 700 000
Cumul C.A		63 867 767
Cumul Charges Expl		47 379 301
Assistance Technique		3 193 388
Cumul du résultat		**15 712 524**
Cumul Produits Financiers		42 183 295

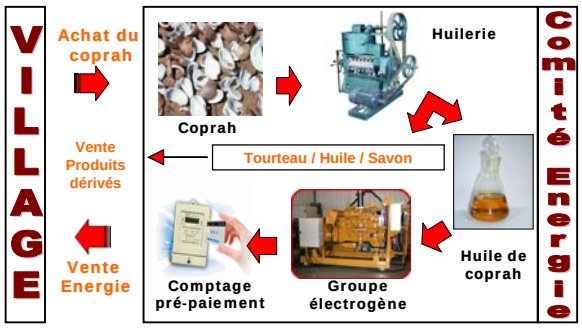


unelco svez

COMMUNITY INVOLMENT IN THE CONSTRUCTION, A MUST

unelco svez

Principe d'Exploitation



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OIL PRESS — EXTRACTING COPRAH MEAL

unelco svez

100% coconut oil generator 40 KWH

Card Meter

unelco svez

FOR VANUATU TO SUCCEED

We need a partnership of

- Copra producers
- Cooperatives
- Oil mills
- The Government
- Unelco

To Guarantee supply in terms of :

- **Quantity**
- **Continuity of supply**
- **Quality**
- **Price**

unelco svez

Tobolar's Experiences with Biofuel Development

Mr. Witon Barry, Operations Manager
Tobolar Copra Processing Authority
Majuro, Marshall Islands

Republic of the Marshall Islands
Background (continued)

- 60,000 population
- Half live in the capital of Majuro
- 20% live near the US military base at Kwajalein
- Balance of population is scattered over the outer islands
- RMI's most important crop is copra

Republic of the Marshall Islands
Tobolar Copra Processing Authority

- Tobolar Copra Processing Authority processes copra into crude coconut oil and cake.

- Pacific International Inc., built and now manages and operates Tobolar under contract to the government.

Republic of the Marshall Islands
Copra

- The bulk of our oil and cake is exported, but we have a goal of selling most of our oil locally as fuel.
- Small scale local perfumed body oil market and soap manufacturing

Republic of the Marshall Islands
Copra Processing

- Biodiesel is derived from the reaction of vegetable oil with methanol and caustic soda as a catalyst to produce glycerin and methyl esters.
- Methyl esters are a substitute for diesel fuel.
- The process requires degumming and conversion of fatty acids below .5% before the methanol process.

- Vacuum extraction of the unreacted methanol, washing, settling, and filtering.

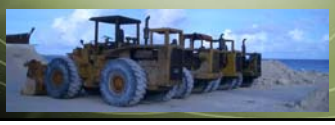
Republic of the Marshall Islands
Experimentation

- Coconut oil's high saponification value and low iodine value make it the best suited of all vegetable oils for use as an engine fuel.
- Experimented using filtered coconut oil as a useful alternative to diesel in case of a shortage.

- Our trial was mainly out of curiosity since.

Republic of the Marshall Islands

- It would cost $4.00 a gallon to produce coconut oil fuel versus Mobil Oil's price of $5.20 per gallon for diesel at this time
- Warnings of fuel deterioration, separation of mixes, preheating to lower the viscosity, gelling and solidification below 24 degrees Celsius.



Republic of the Marshall Islands
Other Published Reports

- Indicated the surprising conclusion that pure coconut oil has the potential to be a superior fuel to commercial diesel in basically standard engines.

Republic of the Marshall Islands
What would happen?

- We wanted to know, not in theory but from actual experience, what happens if you run diesel engines on 100% raw coconut oil?

Republic of the Marshall Islands
Filtering and Delivery System

1. We pump raw coconut oil into a 15,000 gallon settling tank.

2. After one week, we draw off any sediment and pump into a 6,000 gallon tank through a one-micron filter.

Republic of the Marshall Islands
Filtering and Delivery System (continued)

3. After 3 to 4 days, we draw any sediment off the 6,000 gallon tank and pump through a water separator into a 500 gallon service tank.

4. Finally, from the service tank we go through an additional water blocking filter, through a metering pump and dispense to vehicles.

Republic of the Marshall Islands
Filtering and Delivery System (continued)

- For bulk sales, we go directly from the 6,000 gallon settling tank to the customers bulk carrier.

Republic of the Marshall Islands
Filtered Coconut Oil (FCNO) as Fuel

- In February 2002, we started using 100 percent filtered coconut oil in two new vehicles that had seen very little petrol diesel before our use of filtered coconut oil (FCNO).


Mitsubishi Canter 1-ton Flatbed truck.


Mazda 2900 pickup truck

Republic of the Marshall Islands
Partially Refined Coconut Oil as Fuel

- Our refinery process was to remove some of the gums and acids with caustic soda, wash with water then filter and dry.
- When fueled with partially refined oil, the Mazda truck engine began malfunctioning.

- When we opened the engine, there was very little sign of wear and very little carbon buildup.

Republic of the Marshall Islands
Partially Refined Coconut Oil as Fuel

- It was determined that the refined oil had excessive water in suspension from the washing process, causing the injector pump problems.

- We went back to raw filter coconut oil and the problem was eliminated.

Republic of the Marshall Islands
FCNO Problems Encountered

- We started running other trucks and larger engines on the FCNO that had been using diesel.
- Problems we experienced:

- clogged filters
- clogged injector pumps
- rising oil levels in crankcases
- poor engine performance

Republic of the Marshall Islands
FCNO Problems Resolved

- At first we blamed the settling and filtering process, but that wasn't the problem.
- With its detergent properties, the coconut oil dissolved old existing sediment in the fuel tanks and fuel lines and carried this debris to the filters and injector pumps.

- Once a few tanks of FCNO went through the tanks and lines, or when the tanks and lines were cleaned, the problems stopped.

Republic of the Marshall Islands
FCNO Observations

- Some types of engines seemed to tolerate FCNO better than others.
- We noticed that in some engines, crank case oil levels rose.

- We were concerned that the degradation of the lube oil could cause excessive wear to crankshafts and bearings.

Republic of the Marshall Islands
FCNO Theories

- Our theory is that FCNO burns at a lower temperature so that piston rings do not fully expand.
- Other physical characteristics like fatty acid gums, allows partially unburned oil to leak by the pistons into the crankcase.

- Engines that ran hotter had less problems of this nature.

Republic of the Marshall Islands
FCNO Goal

- Our goal is to design a product, using as much coconut oil as possible, that can reasonably be used in any diesel engine.

Republic of the Marshall Islands
FCNO / Diesel Mix

- A little over 2 years ago, we started using a blend of 50% FCNO with 50% diesel.
- Being alerted to the possibility of rapidly clogged filters from dissolved sediments, this blend allows satisfactory use of our FCNO.
- All of our diesel equipment and engines, from 5 to 1,000 horsepower, run on this blend.
- We have not noticed any significant reduction in speed or power on most engines.

Republic of the Marshall Islands
FCNO in Use




Republic of the Marshall Islands
FCNO Plans

- To maximize the use of FCNO will require experimenting and developing different blends for different engines.

Republic of the Marshall Islands
FCNO in Use



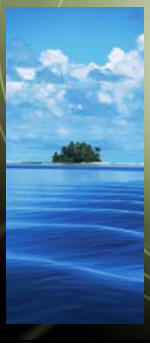

Republic of the Marshall Islands
FCNO in Use



Republic of the Marshall Islands
FCNO Benefits

- Environmentally friendly
- Renewable energy source
- Reduces tailpipe emissions, visible smoke and noxious odors.
- Nontoxic
- Biodegradable
- More safely handled and stored than petroleum or other fossil fuels
- Reduces carbon dioxide, carbon monoxide, and sulfur dioxide emissions

Republic of the Marshall Islands
FCNO Benefits (continued)



- Can be used in existing engines and fuel injection equipment with no modification
- Has minimal effects on operating performance
- Readily blends and stays blended with petrodiesel so it can be stored and dispensed wherever diesel is sold
- High flash point of 150 degrees Celsius makes it one of the safest of all alternative fuels
- It is the only fuel that can boast a zero total emissions production facility

Republic of the Marshall Islands
In Conclusion

- Filtered raw coconut oil, without any further processing, appears to be the least cost-technology solution with the most cost-benefit and will help energize the economies of copra producing countries.

EQUIPMENT DESCRIPTION	ENGINE MAKE	TYPE / CYLINDERS	MODEL	HP	N	TI A	S C	I C	INJECTION PUMP TYPE
90 TON HYD CRANE	CUMMINS	INLINE / 6	TM-890	250		X			(PT) DIRECT INJECTION PUMP
60 TON HYD CRANE	CUMMINS	INLINE / 6	6 CTA - 8.3	250		X			IN-LINE INJECTION (COMPACT TYPE)
CAT 910 LOADER	CATERPILLER	INLINE / 4		82	X				IN-LINE INJECTION (SLEEVE METERING)
CAT 966 LOADER	CATERPILLER	INLINE / 6	3306	150		X			IN-LINE INJECTION (SLEEVE METERING)
CAT 980 LOADER	CATERPILLER	V / 8	3408	300		X			IN-LINE INJECTION (SLEEVE METERING)
CAT 988 LOADER	CATERPILLER	V / 8	3408	350		X			IN-LINE INJECTION (COMPACT TYPE)
TRACTOR TRAILER	CUMMINS	INLINE / 6	NTC230	280					(PT) PUMP DIRECT INJECTION
DEBORAH-K	DUETZ KHD	INLINE / 6	SBA6M328	870					IN-LINE INJECTION (COMPACT TYPE)
MERCY-K	HANSIN	INLINE / 6	6ULD26	750		X			IN-LINE INJECTION (COMPACT TYPE)
SERVICE TRUCK COMPRESSOR	DETROIT	INLINE / 3	3-53	60	X				DIRECT INJECTION W/PUMP
R35 EUCLID DUMP TRUCK	CUMMINS	INLINE / 6	NT 855	335		X			(PT) DIRECT INJECTION PUMP
DUMP TRUCK	DETROIT	V / 6	6V-92TA	280		X	X		DIRECT INJECTION W/PUMP
TUG BOAT	MIRRLEES NATIONAL	INLINE / 8	5826-4	1048		X			IN-LINE INJECTION (COMPACT TYPE)
CASE BACKHOE 580K	CUMMINS	INLINE / 6	4T-390	85		X			ROTARY
100KW GENSET	CATERPILLER	INLINE / 6	D333-A	180		X			IN-LINE INJECTION (SLEEVE METERING)
MITSUBISHI PICK UP	MITSUBISHI	INLINE / 4	4D56	80	X				ROTARY
FORD RANDER	FORD	INLINE / 4		80	X				ROTARY
NISSAN	NISSAN	INLINE / 4	3308	76	X				ROTARY
YANMAR GENSET	YANMAR	INLINE /	3KTL	70					IN-LINE INJECTION (COMPACT TYPE)
CAT 245 EXCAVATOR	CATERPILLER	INLINE / 6	3406	280	X	X			IN-LINE INJECTION (SLEEVE METERING)

IN-LINE (COMPACT TYPE)	IN-LINE INJECTION PUMP (USES ENGINE OIL FOR LUBRICATION INJECTION PUMP)	1 PRESSURE SYSTEM PER CYLINDER
IN-LINE (SLEEVE METERING)	IN-LINE INJECTION PUMP (USES DIESEL FUEL CIRCULATION FOR LUBRICATION)	1 PRESSURE SYSTEM PER CYLINDER
ROTARY	DISTRIBUTOR TYPE INJECTION PUMP	1 PRESSURE SYSTEM FOR ALL CYLINDERS, BUT HAS DISTRIBUTION SYSTEM
DIRECT INJECTION	DIESEL IS REGULATED BY INJECTOR NOZZLE	EACH NOZZLE ACTS AS REGULATRO

Thank You!

Kommool Tata!

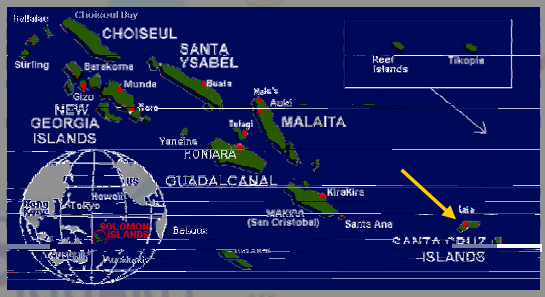
Lata Coconut Oil Trials

Solomon Islands Electricity Authority

Solomon Islands Electricity Authority

- Operates in nine centres with Honiara being the major centre
- Total installed capacity of 33.5 MW with Honiara accounting for 27.2 MW and a Maximum Demand of 13.2 MW
- Total Customer base of 10,150
- 2007 Sales of 64.5 GWh
- All diesel fired generating sets except for 2 hydropower units at 2 locations rated at 182 kW

Project Location



Project Description

Pilot project will convert one of three diesel generators to run on coconut oil

Objectives

- Determine the viability of using coconut oil as a diesel substitute
- Use experiences learnt at the trial in other locations
- Reduce fuel bill
- Create income generating activity for the rural population

Typical Powerstation

Project Background

- Lata was picked as a suitable candidate for the following reasons:
  - Non regular shipping
  - Furthest location with landed cost of fuel being the most expensive
  - Existing coconut oil extraction mill owned by the local government.

Conversion and Trials

- Theory
  - Vegetable oils can be combusted to produce energy
  - Directly injected into compression engines
  - Specific qualities require specific technical solutions to overcome them

Comparison of Properties of Diesel and Vegetable Oils

Fuel	Specific Energy (MJ/kg)	Cetane Number	Kinematic Viscosity (cS)	Solidification Point (°C)	Iodine Value	Saponification Value
ADO	45.3 Gross 42.5 Nett	40 - 60	2 – 4	- 9 (Cloud point)	-	-
Coconut Oil	42 Gross 38 Nett	60 (Est)	26 @ 40 °C	20 – 25	10	268
Palm Oil	39.6 Gross		89	30 – 35	54	199
Rapeseed	40 Gross	41	37 @ 40 oC	-10	125	189
Soybean	37	34	38 @ 40 oC	-16	130	191
Linseed	39.7		29 @ 40 oC	-24	179	190

Source: Etherington, Mehendrarajah and Kennedy, *"Biofuel Energy from Coconut for South Pacific Island Economies: Technology, Economics and Institutions"*, 1999.

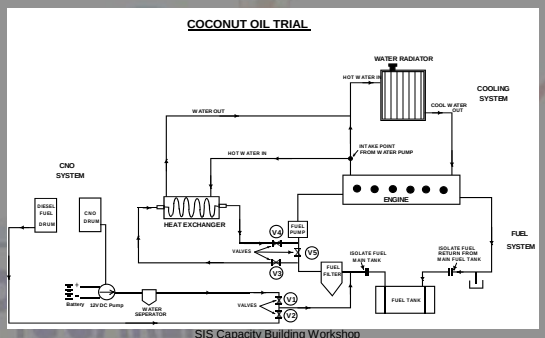
Specific Attention

- Higher viscosity than diesel
- Higher solidification temperature
- Specific Energy comparative with diesel ~ 90% of that of diesel

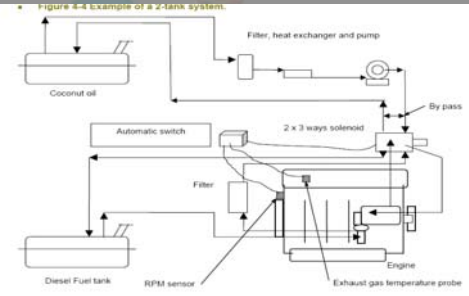
Modification

- Ensure coconut oil flow
- Ensure sufficient fuel flow rate
- Diesel Engine specs
  - Engine Make: Perkins
  - Model: 1006-TAG
  - Engine Speed: 1,500 RPM
  - Rating: 88 kWe
  - Year Installed: 1993

Schematic of Modifications



Commercial Conversion Kit



- Two tank system
- Heat exchanger for heating coconut oil
  - Utilised copper tubes for element
  - Hot water from engine is circulated through exchanger
  - coconut oil is passed through the heat exchanger
- Coconut oil pump
  - Used to pump coconut oil from tank through water separator, heat exchanger and fuel pump.
  - 12VDC motor vehicle pump

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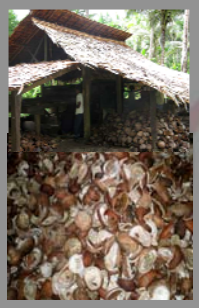
Applications

Coconut Oil

- Extracted from hot air dried copra
- Settled in settling tanks for one week
- No specific filtering process
- Delivered in 200 litres drums



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Applications

Historical Copra Production

Year	Western		Choiseul		Isabel		Central		Guadal		Malaita		Makira		Temotu		Total
	[t]	[%]	[t]	[%]	[t]	[%]	[t]	[%]	[t]	[%]	[t]	[%]	[t]	[%]	[t]	[%]	[t]
1998	6150	9.5	2598	8.7	2360	8.7	1612	5.9	4380	16.1	5018	18.4	3173	11.6	1990	7.3	27281
1999	6830	10.5	2450	8.1	1692	8.1	1123	4.8	4637	11.1	4637	20.0	2239	9.6	1502	6.5	23242
2000	5211	12.8	2501	8.2	1597	8.2	1179	6.0	4797	8.6	4797	24.5	1749	8.9	834	4.3	19545
2001	213	5.4	88	3.2	51	3.2	426	26.3	313	20.1	313	19.3	157	9.7	45	2.8	1620
2002	220	1.0	16	6.4	100	6.4	617	39.7	211	13.6	265	17.0	112	7.2	14	0.9	1555
2003	2475	5.1	890	1.3	230	1.3	5651	32.2	3314	18.9	3012	17.2	1001	5.7	950	5.4	17525
2004	3506	5.4	1233	3.8	870	3.8	3883	17.1	7572	33.4	3560	15.7	1748	7.7	294	1.3	22667
2005	4060	4.1	1072	6.8	1770	6.8	5440	20.8	7314	27.9	3782	14.4	1992	7.6	730	2.8	26162
2006	3325	4.3	915	6.8	1437	6.8	4460	21.0	5970	28.1	3140	14.8	1520	7.1	500	2.4	21267

Source: CEMA report.

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Applications

Copra and Coconut Oil Potential

SIEA Site	Province	Copra availability	CNO availability	% of SIEA generation potentially met by CNO fuel	
				Current	With grid extension
		[kg/year]	[Litres/year]	[%]	[%]
Lungga & Honiara	Guadalcancal	5,600,000	3,360,000	18	
Noro					
Gizo	Western				
Munda		3,000,000	1,800,000	85	56
Auki	Malaita			334	253
Malu'u		3,000,000	1,800,000		
Kirakira	Makira	1,500,000	900,000	654	291
Lata	Temotu	500,000	300,000	280	280

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Applications

Trial Results

- Initial Test Run (9 December 2003)
  - Coconut oil heated to only 50 ^{o}C (ideally 70 ^{o}C)
  - Coconut oil flow rate from pump 0.5 litres/minute
  - Lasted 3 hours
  - Engine starved of fuel and “hunting”

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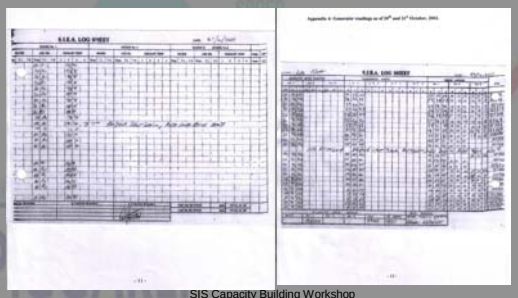
Applications

Trial Results

- Second Trials (18 Sep – 21 Oct 2003)
  - New coconut oil pump (2 litres per minute)
  - New heater installed in coconut oil tank (70 ^{o}C)
- Engine parameters were comparable with when running on diesel
- However, engine temperatures were high
- Several shutdowns due to high temperatures



- After sometime engine started “hunting” again
- Clogged filters (standard 10 micron filters)
- Engine switched to diesel frequently to avoid shutdown
- Frequent filter changes

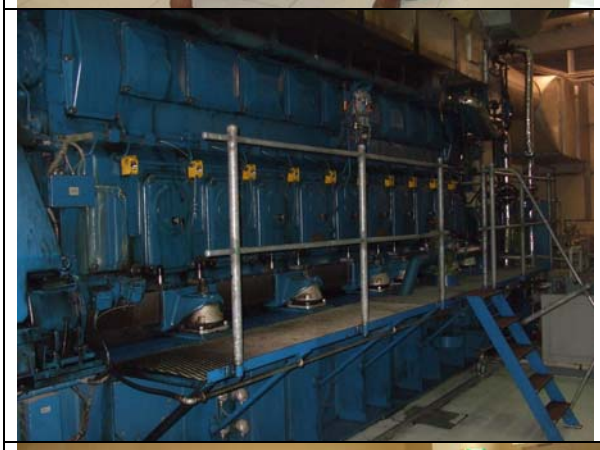
Experiences Gained

- Technically possible even with non-commercially available kits
- Quality of coconut oil must be addressed through appropriate filtering process
- Engineers and tradesmen have gained valuable experience.

Looking Ahead

- SIEA looking at resuming trials for extended periods
- Explore appropriate filtering methods
- Use commercially available dual fuel kits
- Timely with increasing price of fuel
- Has potential to be successful
- Replicated to other locations

Tour of the UNELCO biofuel facilities



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Rupeni Mario, Energy Adviser, Community Lifelines Programme

Energy Efficiency & Conservation – Approach and Challenges

Biofuels – Rural Electrification Experience

SIS Capacity Building Workshop on Renewable Energy Technology Applications
Melanesian Hotel,
Port Vila, Vanuatu: 21 - 25 April 2008

SPREP

SOPAC

Presentation Contents

Energy Efficiency & Conservation

- DSM – demand side management
- Earth Hour experience in Fiji
- Nauru Challenge

Renewable Energy

- Fiji Biofuels – Taveuni & Vanua Balavu
- Video on "Energy Opportunities ...."

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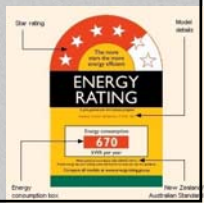
Demand Side Management

- approach – Power Utilities to engage the high electricity consuming customers
- activities – training, awareness /educational, demonstration projects
- challenges – Power Utilities not too keen (not their core business, mindset is that the more power they sell the better, demonstration project $$s are not attractive, efficient appliances are not readily available, efficient technologies are expensive, no incentives,……)



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Earth Hour Experience in Fiji

- What is it? – a world-wide event where businesses, offices, individuals, organisations turn off unessential lights /appliances for 1 hour (8-9pm) on Saturday, 29th March, will be an annual event
- Impact – "when compared to a regular Saturday, the Earth Hour Saturday resulted in **energy savings of approximately 11.2 MW or 14.1%** during the 8pm to 9pm period"; CO_2 emissions reduced by 7.34 tonnes which is equivalent to burning 2,433 litres of diesel
- Should be – an everyday event

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The Nauru Challenge

- activities – public awareness /educational, capacity development of local entities, energy auditing, develop an energy efficiency action plan
- challenges – electricity supply is not on 24-hour basis; cash flow issues on the island – payment of tariff; cooking with electricity (proposed LPG use for cooking?); limited options in terms of available appliances /technologies; etc
- status – commenced in March 2008

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Evaluation of the Biofuel Projects in Taveuni & Vanuabalavu




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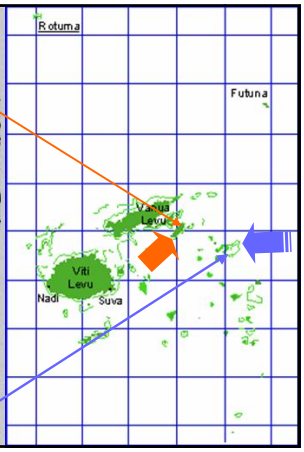

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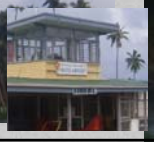
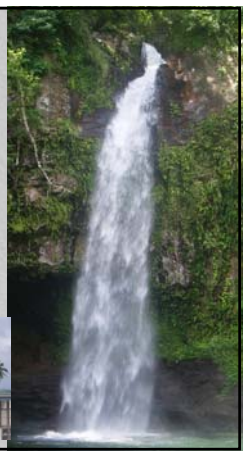
Taveuni



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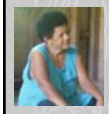
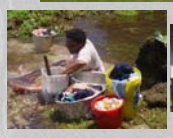
Welagi Village




- 48 Households
- Each family producers an average of 1000kg of dalo per month (sold at $0.60 - $2.10 per kg)
- Village has a consistent source of income (land lease) F$48,000 p.a.
- Can produce about 150 litres of coconut oil

Generator

- Generator currently runs on diesel only
- The auto-switch that switches from diesel to coconut oil is faulty
- Consumes an average of 200 litres of diesel per week (F$295 diesel @ $1.48/litre)









LOAD

Households have:

- TV / Video
- DVD Player
- Stereo / Radio
- Washing Machine
- An average of 2 lights
- Refrigerator / Freezer
- Iron

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Copra Production

- Equipment at the mini oil mill is rusty, copra dryer needs a refurbish.
- Cutting copra is done once a week (Mon)
- Not everyone can cut copra




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Situation in Welagi

- Each household pays F$3.50 per week (Total = F$168)
- Village Committee subsidises F$127 per week (to buy 200 litres of diesel)
- The villagers have ceased cutting copra since October – November 2005 (Tractor broke down)
- Villagers sell dalo for income (price ranges from F$0.60 to F$2.10 per kg)
- The generator currently runs on diesel only
- There are mixed reactions: many would like to stay with diesel – reliable and less problems with generator; whilst some would like to see the generator running on coconut oil – high fuel cost
- A few have stated dissatisfaction on the tariff structure – households having only lights & TV/video pays the same amount as those having additional electrical appliances

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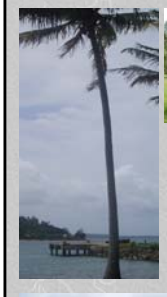
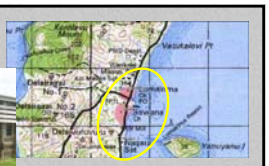
Vanuabalavu





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Lomaloma, Sawana & Naqara Villages









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Oil Mill and Generator

- Currently nothing is in operation
- The oil mill has ceased operation due to "bankruptcy"
- The CAT generator has not been in operation since the closure of the oil mill
- The biofuel generator has not been in operation since March 2005 due to mechanical problems.
- A number of households in the 3 villages have their own small gen-sets (spending $50/wk on fuel)






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Situation in Vanuabalavu

- The **closure of the oil mill** was attributed to the profits been used to salvage a similar oil mill in Lakeba [the mill in Vanuabalavu and Lakeba were managed by the same Company]
- This resulted to **importing coconut oil** from Savusavu via Suva (expensive compared to diesel)
- The **committee** to oversee the electricity generation **does not exist at the moment**
- Households with **own gen-sets** spent an average of **F$30 - $50 a week**

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Findings

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Summary

TABLE A Summary of Options

	Vanua Balavu	Welagi
Benefits	Access to electricity	Access to electricity
Option 1 – Local production of coconut oil.	-	$510/week
Option 2 – Purchase diesel for use in gen-set.	$630 /week	$310/week
Option 3 – Purchase commercially-produced coconut oil for use in gen-set.	$749 /week	$349/week
Engine overhaul costs	$25,000	–
Option 4 – Vanua Balavu only. Replace current biofuel gen-set with 2 diesel gen-sets.	$160,000 (investment cost of buying the gen-sets only; does not include logistical & other costs)	–

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Technical Aspects

- **Diversification of generation** – have the option of using either diesel or coconut oil
- **Demonstration effect** – the outcomes would have an impact on possible replicability
- **Introducing complexity** – would lead to the need to acquire new skills and knowledge
- **Resource Risks** – can be reduced through detail study & knowledge of the copra industry
- **Suitability of the Technology** – strong track record and manufacturer guarantee should be considered. Metering at the power house is required for monitoring purposes
- **Power Quality** – metering & monitoring would enable detection of any variation in frequency, voltage, etc which could be detrimental on appliances
- **Environmental Impacts** – use of alternative fuel (coconut oil) reduces emission of harmful gases

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Lessons

- An integrated approach whereby all aspects are taken into consideration
- An energy analysis of a community to consider social, economical, environmental and any associated risks to the operation of the project
- Consider the fuel supply risks
- The participation of all key stakeholders from the development phase to implementation, monitoring and evaluation is an important feature of any project
- Tariff has to be structured to include true costs to enable sustainability of the respective projects.
- Perhaps a biofuel-based RESCO similar to that established for PV systems.

Thank you

Wind Power

TEC Wind Energy Assessment Project

SIS Capacity Building Workshop on RE Technology Applications
Melanesian Hotel
Port Vila, VANUATU
21-25 April 2008
by
[Mafalu LOTOLUA]

1

Project Site

2

Background Information

Stages of Installation-Inside TEC Compound

- PROJECT LINKAGE TO NATIONAL PRIORITIES
  - National Strategy for Sustainable Development 2005-2015-Te Kakega 11 and the Energy Policy:-
    - Improve the well being of Tuvalu Citizen by promoting RE.
    - Implementing cost effective, equitable, reliable, accessible, affordable, secure and environmentally sustainable energy systems.
- SOPAC/PIEPSAP assisted TEC in preparation of tenders document and TOR.
- TEC was involved in the evaluation of Tenders.

3

Background Information

- It took more than six months from the tender to the arrival of equipments in Tuvalu.
- Equipments from NRG Systems in the United States.
- Project equipments were free of duty
- Installed in May 2007 by Alpha Wind Energy ApS Consultant, Denmark.
- Training was provided by the Consultant on the following areas:-
  - Maintenance of mast/installation and regular site check
  - Data collection procedures
  - Data security – data transferred to TEC computer then send to SOPAC and Alpha Wind Energy
  - Data check / Analysis – at every 4wks

4

Technical Institutional & Financial Design

Wind Assessment Mast-Installed May 2007

Readings from logger pre commissioning check

Stages of Installation-Inside TEC Compound

1. Technical Support from UNDP, the Government of Denmark (via UNEP & SOPAC/PIEPSAP)
2. Institutional Support from Alpha Wind Energy ApS Consultant, Denmark, and Tuvalu Electricity Corporation assisted with the Installation
3. Finance – US$55,000

5

Technical & Financial Performance of the Project

If the assessment a viable wind resource the next step would be a feasibility study assessing technical, institutional, environmental, social, economic and financial issues of wind power utilization in Tuvalu.

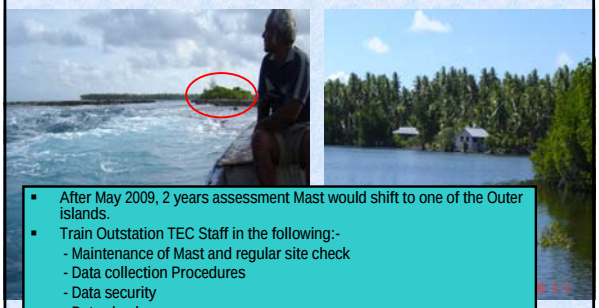
Applications of the Energy Services provided by the Project

1. Minimise dependency on diesel oil.
2. Reduce Co^2 emissions.
3. Broaden the energy supply in Tuvalu
4. Reduce Government subsidy
5. Increase awareness of links between climate change, energy use and greenhouse effect production and environment and poverty issue.

Wider Community Benefits from the Project

- Lower fuel tariff/surcharge rates –Lower monthly electricity bill.
- Increase Energy security and self sufficiency
- Strengthen Tuvalu's case in climate change negotiations
- 24hrs operation at the outer-islands-improved quality of life and food security.
- Reduce the risk of damaging the marine spices from fuel spills at the outer islands.

Future Assessments

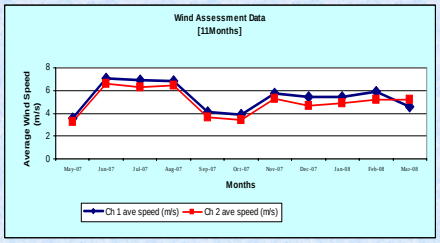


- After May 2009, 2 years assessment Mast would shift to one of the Outer islands.
- Train Outstation TEC Staff in the following:-
  - Maintenance of Mast and regular site check
  - Data collection Procedures
  - Data security
  - Data check
  - Basic Computing Skills
  - Looking at the possibility of data remotely transferred

Technical Data-[11months]

	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08
Ch 1 (30m) ave speed (m/s)	3.6	7.1	6.9	6.86	4.1	3.86	5.78	5.44	5.41	5.94	4.6
Ch 2 (20m) ave speed (m/s)	3.28	6.58	6.3	6.44	3.68	3.45	5.25	4.68	4.86	5.2	5.2

Data from Memory Chips



Any Problem Faced by the Project?

- Lack of support from Landowners resulted in installing inside TEC compound.
- Missing of equipments during transshipment.
- Took too long for the approval of tax exemption from Minister Finance.
- Timeframe to monitor all islands of Tuvalu

How the Project can be Improved?

- Procure equipments close to home.
- Lease land for mast Installation.
- To set clear regulation on tax exemption.

VANREPA

Vanuatu Renewable Energy and Power Association

David Stein
Team Leader
VANREPA
May 16, 2008

VANREPA

Vanuatu Renewable Energy and Power Association

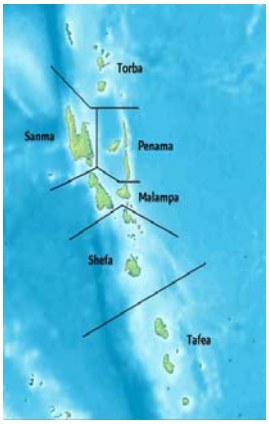
Vanuatu Renewable Energy and Power Association (VANREPA) is an NGO based in Port Vila, Vanuatu. VANREPA's primary objectives are to promote and deliver renewable energy solutions to development needs.

VANREPA works in three program areas:
- Energy in the Schools
- Energy and Water
- Green Power to the People

Our Logo
- Infinity Symbol
- Sand Drawing

"The Answer is Blowing in the Wind"

- Funded by the EU – ACP Energy Facility
- Located on the islands of Futuna and Aneityum in Tafea Province
- A project with two objectives:
  - The provision of wind generated electricity
  - The establishment of community-based "utilities" – which we call RESCoops
- Follows the "Community Powerhouse" concept, developed by VANREPA



Community Powerhouse

- Community management organization / community energy utility
- Renewable energy-powered micro-grid and battery-charging station
- Provides electricity for community institutions and households
- Financed by a mix of donor and local funds

Community Powerhouse

- Community Consultation, Feasibility Study and Impact Assessments
  - What is the right project for the community?
  - What are potential impacts?
  - What would the model look like in this community?
- Developing a Community Management Organization
  - Form follows local governance practices
  - Capacity Building

VANREPA

Vanuatu Renewable Energy and Power Association

Tank yu tumas

Wind Power on the Island of Mangaia – Cook Islands

Mangaia

The Power Station

- It has been in operation since the early 1980's
- 3 stations originally
- Interconnection project in 1995/6
- 24hr power in 2001

Power Station Upgraded

Generators are Diesel Fueled 1x90kW 2x80kW 1x40kW 1x30kW




Fuel Storage Facilities

- 2 x 16000 Litres storage tanks
- 1 x 6000 Litre Bulk tank
-



Wind tower Power

- 2 x 20 kW turbines
- 30 m high
- 10 m blades
- Grid connected
- Vergnet supplied
- Preface pilot project
- Average wind 7 m/s
- 2.5 years of wind data

High Voltage lines installed.

Towers are lowered for maintenance.

Minimal Maintenance

Assembly stage

Control Room

- 5x Genset controls & synchronizing
- 1x Wind Turbine remote control

Power Factor Correction

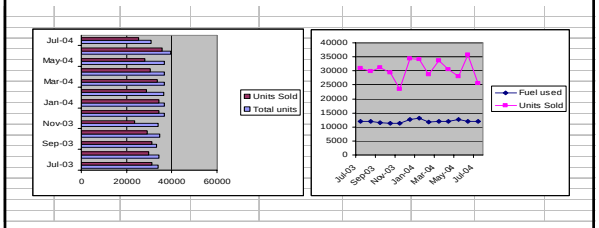
- 2 x Reactors installed on original system
- Standard PF @ .89 inductive

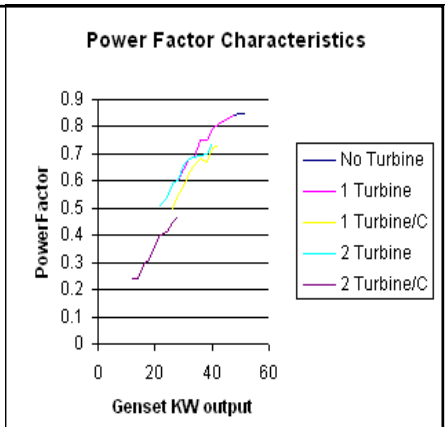
Turbine Controls

- 3 phase 420 V
- Soft start synchro
- PLC control
- Parameters adjustable
- Dual feed Transformer

Monitoring Before & After

- Recording of fuel usage
- Recording of power produced & sold





Community Involvement

- Mangaia School-Hut & Graves
- Aronga Mana – Site
- Island council – MOU
- MIA - Construction

Mangaia School involvement

Issues /benefits

- Communication costs
- Power Factor
- Fuel consumption
- Erosion control
- Public expectations
- Safety concerns
- Tourism benefits
- Economic viability

A view for the future
Minimal fossil fuels used.

VERGNET

L'INDUSTRIEL FRANÇAIS DE L'ÉOLIEN

DEVIL POINT WIND FARM A SUCESSFUL APPROACH

2008 PIGGAREP Workshop

Port Vila 21 – 25 April 2008

Jérôme Sudres
Australia & pacific
Development Manager
J.sudres@vergnet.fr

WHAT WE WILL TALK ABOUT ?

- WIND ENERGY AN INTERNATIONAL ANSWER.
- DEVIL POINT SITE SELECTION
  - Wind mapping
  - Wind Atlas
  - On site wind monitoring
- ADAPTED TECHNOLOGY FOR POINT
  - Turbine Range
  - Remote constraints
  - Cyclones risk
- PIC's A NATURAL OPPORTUNITY
- QUESTIONS

3

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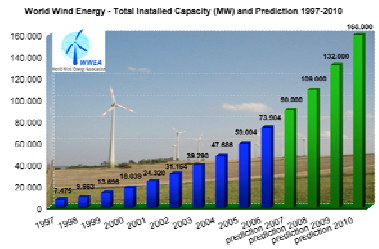
4

Wind Energy an international answer.

5

Wind Energy an international answer.

- wind energy is now increasing more than any other power technology.



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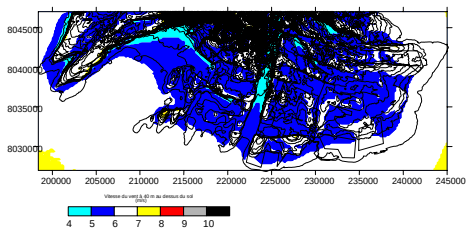
8

DEVIL POINT SITE SELECTION

- Wind Mapping: The policy tool.



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10

DEVIL POINT SITE SELECTION

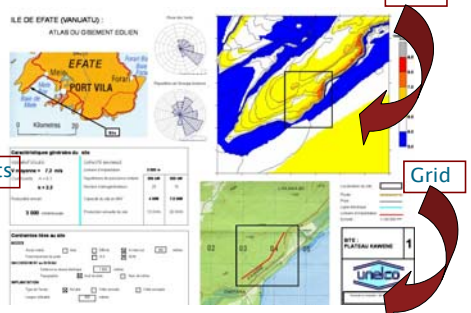
- Wind Atlas: The Feasability analyse.

Location

Wind

Constraints

Grid



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12

DEVIL POINT SITE SELECTION

- On site wind monitoring: The validation phase.
- 12 month wind data.
- Land negociation
- Neighbrorhood sensitisation

13

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15

ADAPTED TECHNOLOGY

16

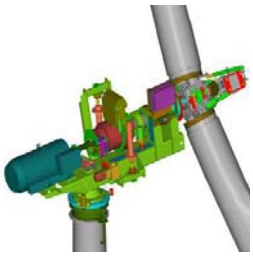
TURBINE RANGE OF PRODUCTS

GEV MP 275 kW

GEV HP 1000 kW

17

GEV MP 275kW – VERY LIGHT ARCHITECTURE

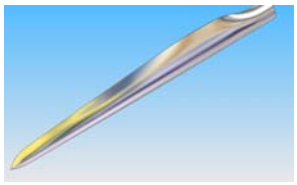


- 50 to 60m hub height
- 26 to 32 m rotor
- Two blades
- Down Wind
- Pitch regulated
- Teetering hub
- Guyed Tilting Tower
- Small foundations:
  - 15m3 concrete
  - anchored on micro-piles
- Asynchronous generator, 2 speeds
- Flexible, then very resistant

18

GEV HP FARWIND 1000 KW

- 70 m hub height
- 55 a 62m diameter
- 2 blades
- Teetering hub
- Pitch regulated
- Variable speed
- Guyed Tower



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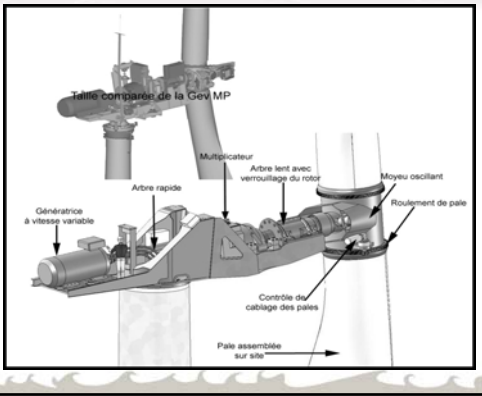
GEV HP FARWIND 1000 KW



20

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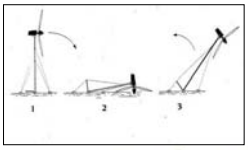
21

TILTABLE DEVICE

- The turbine can be laid down in protection position
- This position is used for assembly and maintenance



22

LIGHT LOGISTICS

- This technology is twice lighter than other turbines of same range
- All parts fit in 20' and 40' containers
- Installed with usual trucks and 20 tons cranes
- Nacelle with blades: 8.7 tons (GEV MP)
- Tower : 12 tons (GEV MP)

23

EASY INSTALLATION

- Foundations
  - 9 drillings, 6'' diameter for anchoring
  - About 15 m3 of concrete per turbine
- Installation
  - Installation at ground level
  - Self erection of the turbine through integrated winch

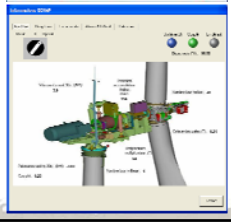
24

EASY MAINTENANCE

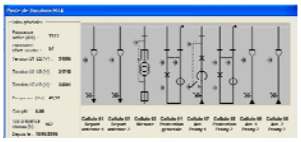
- Maintenance performed at ground level
- Blades cleaning at each maintenance operation
- Quick and easy replacement of heavy components

25

GRID INTEGRATION



- Connection to small and medium size grids
- Specific connection solutions
- Automatic power regulation
- SCADA control system



26

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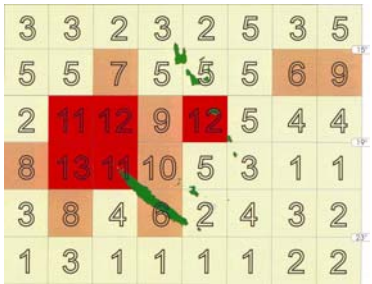
27

DEVASTATING CYCLONES

CYCLONE RISK IN SOUTH PACIFIC

- Number of cyclones for each geographical area for a period of 25 years.



29

CYCLONES DAMAGES

- Nothing can resist winds up to 250 km/h
- Ex : New Caledonia, Japon.
- Increase the resistance reduces the performances and raise the cost

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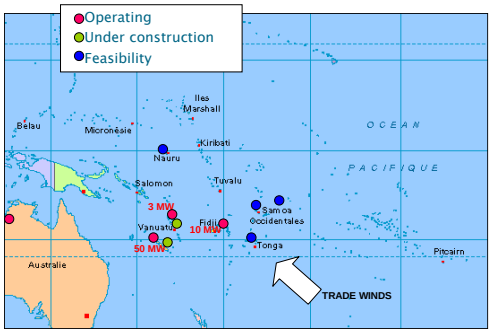
31



32

FARWIND IN THE PACIFIC

NEW CALEDONIA :

- 7 wind farms – 120 turbines
- More than 25 MW installed
- 50 GWh / year of wind energy

FIJI

- 1st wind farm operating Aug 07
- 37 turbines
- 10 MW on 80 MW grid

33

Wind DIESEL System 2.2 MW of diesel – 825 kW of wind

CORAL BAY

- Western Australian Coast, 1100 kilometres North of Perth
- Population 500 to 2000 h

- High wind penetration system allows over 90% of wind energy.
- Over **62 % of the energy** for Coral Bay produced **from the wind** with Perfect quality of power supply since august 2007.

34

Jérôme Sudres – Australia & pacific development Manager
j.sudres@vergnet.fr

35

Tour of the UNELCO wind power installations

Hydro Power

REPUBLIC OF VANUATU

VANUATU HYDROPOWER DEVELOPMENT (SARAKATA HYDROPOWER PROJECT)

SIS CAPACITY BUILDING WORKSHOP ON RENEWABLE ENERGY TECHNOLOGY APPLICATIONS, PORT VILA, VANUATU,

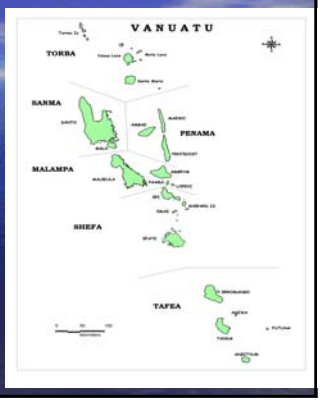
21ST – 25TH APRIL 2008

BACKGROUND

- Vanuatu is blessed with so many rivers
- Hydropower identified as sustainable energy path for sustainable development
- Sarakata hydropower project was the 1st ever hydropower project constructed

SARAKATA HYDROPOWER PROJECT

- Build on the island of Santo using grand from Japanese Government
- Basic design study done in 1990
- Designed for 3 phases – 1st and 2nd completed in 1993/1994 consecutively
- 3rd phase under construction
- Hydropower supplies power to luganville town (Vanautu's 2nd town)



Why 3rd phase

- Rated capacity of 600kw not enough to meet the demand
- Need for more power due to growth of power demand
- More activities/developments undertaking in Luganville
- Need for maintenance on water canals and access roads
- 2yr project; started March 2007 and end March 2009

Technical specifications

- Installed capacity for 1st and 2nd phase is 600kw (2 x 300kw)
- Proposed 3rd phase generator would be of another 600kw
- Overall capacity after 3rd phase – 1.2MW
- Horizontal Francise Type turbine generator
- Head of 28m (low head)
- Catchment area of 97km2

Institutional setup

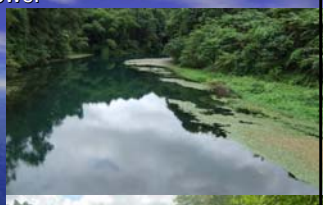
- The Hydropower project belongs to GoV and was under Energy Unit
- Sarakata technical hydropower committee oversees the project
- Committee comprises of PEO (secretariat), Unelco, Sanma Provincial Govt, LMC, Director of Finance, DG of Lands and Minister of Lands
- Responsible for the allocation of use of sarakata savings
- At least more than 2 meetings every year

Management set-up

- Unelco (Power Company) manages the hydropower
- Tariffs were based on the utilisation of diesel fuel
- Total annual net revenue- approx. 400,000,000vt (3,333,333USD)
- Savings of 50 million vatu (416,670USD) per year (profit)

Benefits of the hydropower

- Provides very reliable electricity in Luganville
- Ease global warming by reducing CO2 gas emissions
- The savings earned were used for:
  - Expansion of HV and LV delivery lines and electrifying Ni-Vanuatu houses in Luganville
  - Subsidizing electricity tariffs in Luganville
  - Payment for Luganville street lighting maintenance
  - Subsidizing Ni-Vanuatu household connections in Malekula and Tanna
  - Rural electrification programmes
  -



Constraints/challenges in hydropower develo

- Land issues
- Political issues
- Geographical constraints
- Capital investments – Van GoV depends mainly on foreign investments for hydro development
- Power demand – good potential of hydropower but inadequate power demand
- Sarakata Savings not utilised according to the initial designed purpose.i.e to for rural electrification purpose

Conclusion

- Vanuatu has huge potential to develop its hydropower for electricity purposes
- With Sarakata hydropower, good experiences were gained
- Talise Hydropower – possible funding from Italian Fund
- Other potential hydropower sites still await funding

TANKYU !

MALO!

VINAKA!

Hydropower Development in the Solomon Islands

SIS Capacity Building Workshop
on Renewable Energy Technology
Applications

Hydropower Potential

Island	Number of Sites	Micro Hydro (kW)	Mini Hydro (kW)	Small Hydro (kW)	Total (kW)
Guadalcanal	49		1,210	236,100	237,310
Malaita	23	90	2,700	28,000	30,790
Santa Isabel	6		610	4,100	4,710
New Georgia	23	320	4,840		5,160
Santa Cristobal	12	20	371	25,500	25,891
Choiseul	15	140	2,030	20,030	22,200
Santa Cruz	2	50	260		310
					326,371

Source: ***"Master Plan Study of Power Development in Solomon Islands", Tokyo Electric Power Services Co. Ltd, January 2001***

SIS Capacity Building Workshop
on Renewable Energy Technology
Applications


Fono to ask hydro power from Japan

SIS Capacity Building Workshop
on Renewable Energy Technology
Applications

Owners of Hydropower Schemes

- Solomon Islands Electricity (SIEA)
- Solomon Islands Village Electrification Committee (SIVEC)
- Churches

SIS Capacity Building Workshop
on Renewable Energy Technology
Applications

SIEA and Churches

- Churches – 30 kW
- SIEA – 180 kW

SIS Capacity Building Workshop
on Renewable Energy Technology
Applications

SIVEC Installed Capacity

Location	Year Installed	Turbine Capacity (kW)	Demand (kW)	Funding Source	Operational Status
Iriri Settlement Kolombangara	1983	10	3 -4	UNIDO	Weir and penstock damaged.
Vavanga Kolombangara	1994	12	8	AusAID	Relocated to new site in 2006
Ghatare Kolombangara	1997	12		AusAID	Not operational due to damage and theft
Manawai Malaita	1997	50	25	Taiwan	Operational - new income generating activities
Bulelavata New Georgia	1999	29	14	AusAID	Operational – supplies school and village
Raeao Malaita	2002	25	14	Taiwan	Operational
Nariaoa Malaita	2004	25		Taiwan	Operational

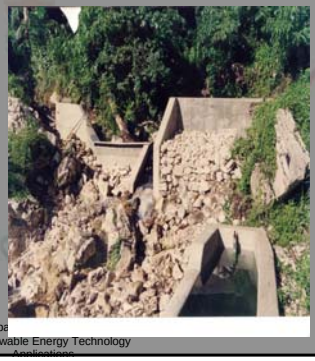
Buala – Santa Isabel

Specifications

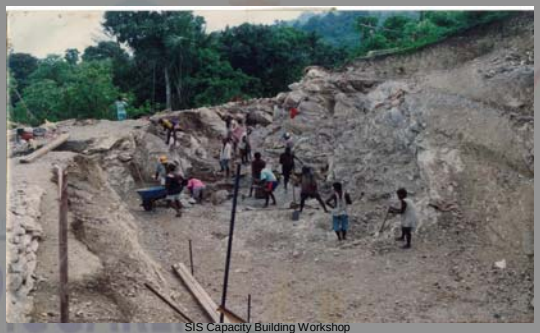
- Installed 1993 and funded by GTZ
- Intake Method – Stream Bed Intake
- Head – 224.4 meters
- Discharge – 90 litres per second
- Penstock – Ductile Iron pipes
- Penstock length – 918 metres
- Rated Output – 150 kW
- Maximum Demand – 86 kW

Intake

Head Race and Spillway



Storage Pond and Forebay



Stone Masonary

Penstock Route with level indicator circuit

Powerhouse

Turbine and Generator

Malu'u - Malaita

Specifications

- Installed 1984 funded by NZ Aid
- Intake Method – Run of the River
- Head – 20.7 meters
- Discharge – 210 litres per second
- Penstock – Asbestos cement pipes
- Penstock length – 122 metres
- Rated Output – 30 kW
- Maximum Demand – 28 kW

Issues in Hydropower Development

- Financing options
- Land acquisition
- Training for local staff
- Technical backup

RE Works in the pipeline

- Feasibility study into Tina River hydropower scheme (26 MW)
- Biomass generation at GPPOL and Pacific Timbers (~ 6 MW)
- SIEA Duel Fuel conversions (2009 – 2012)
- Distributed Generation using RE sources (2006)

6. The Participant's Evaluation of the Workshop

The following are the participants' evaluations of the workshop in their own words:

Andrew Daka, General Manager, SIEA, Solomon Islands

Day 1: Solar Photovoltaic – SIS PV Project Management Experiences

The presentations here were generally of a high standard. The Pacific Islands experiences presented were relevant to a number of projects in operations and the Australian experience only reinforced our experiences.

There is no doubt about the technology; however, the issue is with the management structure in place at village and department level to ensure that the project is viable.

The other important issue to ensuring the success of any project is the education of the village community and the involvement of the community where the project is going to be installed.

Day 2: Experiences with Grid Connected PV, Solar Water Pumps and Bio-gas

Tuvalu's grid connected PV has just been commissioned and results so far have been very positive. Whilst it has been so far working, we have to be also mindful of the pitfalls with PV. The technology is proven technology and it works.

Grid connected PV if owned and operated by the utility presents no problem as it is treated as just another generator into its network. However, where it is privately owned then we need to have in place relevant agreements on tariffs for whichever metering method is applied. Most Pacific island utilities do not have these different tariffs in place and would need assistance to determine this.

The field visit has exposed me to new technology in particular at Epau Village. The bio-gas digester in technology than can be adopted to all villages so that they have readily available gas for cooking and light.

The technical requirements for Grid-connected PV such as Protection against islanding (AS 4777) and voltage and frequency fluctuations can be easily addressed but on weak grids may cause systems to drop, resulting in system instability. Grid-connected PV systems can easily cause confusion and even danger to utility employees if not properly installed.

Day 3: Bio – Fuels

An area of interest to my organisation because of the previous work we have undertaken. We can only learn from UNELCO's experience. Their experience helps us determine the best methods to properly filter any coconut oil we receive and to ensure that it is properly

filtered. The presentation by UNELCO's personnel on site better explained the process and the filtering process their coconut oil went through.

With a little investment for the filtering equipment and considering the ever-increasing price of diesel fuel, this is one area where payback periods will be within acceptable durations.

Day 4: Wind Power

Presentations were very informative and Tokelau's presentation on grid connected PV only reinforced the same issues that had been raised in the earlier presentations.

The experience in wind power generation beginning from the monitoring stages to the experiences of Cook Islands in the installation and operation of the wind turbines were very informative. Vergnet's presentation clearly highlights the necessary phases in the development of wind farms. I am not too sure whether some of the islands currently undertaking monitoring have done any of the wind mapping and atlas.

VANREPA's emphasis on community involvement in the Community Powerhouse concept is new and one where everyone can learn from.

General Comments

The workshop has been a learning experience and like others have learned a lot from other participants. Each of the participating countries have been doing their own thing and have been encountering the same problems. It is now about time that we provide a common avenue where all these experiences can be readily accessed by anyone who wishes.

If I can recommend that SPREP through PIGGAREP make these information available on their website to be accessible to all countries.

As the PIGGAREP program is a five-year program, I would suggest that a follow-up workshop be held sometime down the track to see the progress each country has made during the that period.

Greg Decherong, Palau

Venue: OK

Programme
Overall the programme is well organized, however maybe could have had more staff to assist the participants on our other needs or requirements such as emailing to our offices, other paper works, etc.

Presentations have been very informative and the sharing of the information very useful especially on failures of previous projects and activities.

The make up of the participants is certainly very different than the previous workshops and very good in the sense that it is made up of different organisations and private sector not only Energy Officials, but people who are hands-on on projects and programmes.

The experiences shared are very useful for Palau because they give us ideas and data that are in the field that have been tried, some failed and others success.

Field trips are also very informative and should be encouraged on future workshops to provide us with real projects that we can see and experience by observing first hand. It also gives us an opportunity to see the country and to appreciate the country hosting the workshop.

Travel arrangement was very well organized except for the Nadi-Vila portion, which was not confirmed until I arrived in Nadi.

Accommodation is OK but very expensive. I would have liked to have a place where I would cook myself, but overall was OK.

The workshop is very successful and has really been very informative and should be encouraged more with the participation of more NGOs and private sectors.
Date: 23 April 2008

Joseph Dar, PNG Sustainable Energy Limited – Papua New Guinea.

i) **General comments:**

Firstly my personal appreciation to SPREP through PIGGAREP to arrange such a motivational and educational conference for the Pacific island countries. It is more of a subject the governments of the Pacific island countries should be advocating and promoting as a strategy to combat greenhouse gas emissions which threatens the livelihood of the people and the economy of the region. However, the governments may lack the drive and capacity to administer this phenomenon even though the issue has been around for sometime.

I have learnt a lot by participating and listening to other experiences in renewable energy projects. It has shed some lights to issues and challenges our company has been experiencing over the years with our rural energy projects and also prompts us to take note of the lessons learned by others in RE projects. It also helped me personally to advance my understanding and knowledge on RE technologies.

It also challenges us to do more to perfect the technological applications in the course of improving the living standards of our communities through sustainable development.

ii) Workshop organization

The workshop was well scheduled and organized. Different activities were well timed and sequenced which maintained interest and eagerness to participate actively. Theprayer acknowledging God was a better way to start the day. The recap of the previous days discussions was also a better way of reviewing and bringing to the groups attention the main ideas and issues discussed.

The scene setting at the start of the workshop set the tone of the workshop and provided some sense of direction to the workshop. It also reminded us as one in the Pacific we have our way of doing things "the Melanesian way; the Pacific way." The combination of people from various sectors of the industry and in different countries provided a better blend for contribution and sharing of ideas.

The local Vanuatu representatives facilitated the workshop well in getting site visits and activities outside of the workshop well conducted.

iii) What I have learnt

- Different management approaches to SHS projects;
- Wind speed monitoring, project implementation and related issues;
- Grid connected solar PV systems and related issues;
- RE penetration into exiting systems and related issues;
- Biogas plants as energy source for cooking and lighting;
- Bio-fuel production and usage in engines and their associated issues;
- Hybrid solar and wind for different applications including water supply and telecommunications;
- Mini-grid rural electrification infrastructure used by UNALCO is more applicable for our rural electrification projects;
- Wind monitoring and projects
- Solar PV grid with software monitoring system

iv) Improvements Required

- Travel and workshop arrangement was a bit slow. Confirmed participants should be notified some days advance before the first day of travel for convenience.
- Opportunities should also be extended to young and up coming leaders in the industry to participate in such workshops to broaden their understanding and appreciation of RE application, they are the ones who do the actual work and understand the challenges and demands of the technology. Seems like senior management always have the chances of attending such conferences every time.

David Iro, Managing Director, Willies Electricial, Solomon Is

First of all I would like to take this opportunity to thank all sponsored of this workshop, and the host country Vanuatu for the hospitality and the security, special thanks to Solomone Fifita.

My overall view on the workshop - Very good - the practical failure worth serious follow up on the weakness on various technology applications and turn into strengths.

PV technology is appropriate in some areas, as high lighted, the conditions, and the environments which PV technology is installed are different, they seems to have the same goals and objectives. That is to provide basic lighting and others basic house hold equipments

The most exciting cases was the different management system of the recovering of finance, and expansion of the project to other villages.

It has come out very clear that there is a spread of lack in passing the skills to many house holds the Pacific island countries and lack of encouragement to personally on a system in their future.

The other Renewable energy technology applications are also growing and my personnel opinion is that most presenters are experiences the pain in sustaining of the technology. to the household.

I am convinced that these workshops are very important and I would recommend the following.

A Three level of Technical Capacity Building workshop for Pacific islands technician, and house hold users, and developing a Renewable energy Net - means of communication and sharing of knowledge and skills.

Otherwise thank you again for the opportunity to participate.

Good news is no bad news

Mafalu Lotolua, General Manager, Tuvalu Electricity Corporation

i) **Participant Presentations**

All the presentations were very informative. Learned the failures of various RE projects in other PIC and how to improve it.

ii) **Overall Management of the Workshop**

Satisfactory. For further improvement of future workshops, for transparency purposes a breakdown of per-diem should be given to each participant to reflect properly the number of days of the workshop and transit days.

Secondly, allow sufficient time for each participant to travel to the workshop venue.

iii) A Way Forward

I personally feel that the workshop has been beneficial since there is a mix of experiences of participants, energy department and utility. Most of RE projects in the PIC have been done by the Energy department and presently the Utilities are slowly coming into the show.

I strongly recommended that there be a follow up to learn if there have been any changes since this workshop and also new development RE projects that are coming on.

Rupeni Mario, Energy Adviser, SOPAC

The stated objectives of the workshop were to:

i) Strengthen the capacity in the SIS to Productively Utilize Renewable Energy (PURE) services from stand-alone and grid-connected PV, wind and biofuel through the sharing of field experiences, and
ii) Provide an opportunity for the SIS to observe and to learn from the biofuel and wind power developments in Vanuatu as well as in Australia and other PICs.

[A] Sessions

The presentations by participants were very satisfactory given that the strict guidelines given out by PIGGAREP. In terms of information, the various experiences[1] were well documented and explained during the sessions. The site visitation also enabled participants to observe first-hand the various applications of renewable energy sources such as biogas, biofuels, coconut oil and wind.

[B] Issues Discussed

The issues[2] discussed provided good baseline information particularly for those intending to implement similar projects /initiatives. The documentation of these to be shared in the region would be added value to the development of the respective national energy sectors.

Note – I am proposing to compile a paper that will document the lessons learnt from the respective renewable energy projects that has been implemented over the past years including the ones presented in this workshop. The paper will also add to the delivery of one of the activities referred to by the PEMM-2007 Communiqué.

[C] GENERAL COMMENTS

Overall, the workshop has been a successful one, i.e. meeting its objectives as stated above. It also provided a forum where participating PICs could share the pros and cons including the challenges and how they were solved which formed as possible solutions to other PICs having similar issues.

[1] Government Offices, Power Utilities, NGOs, Private Sector and Individuals
[2] Management structures, financial mechanisms, tariff structures and modality of payments, technical aspects such as equipment specifications, etc

The concept /objective of this forum can be adapted to other sectors in energy such as efficiency and conservation, power and petroleum – i.e. to share the experience from respective PICs.

Finally, a *vinaka vakalevu* to SPREP, Solomone Fifita in particular, for the opportunity to participate and contribute to the deliberations.

Speedo Hetutu, General Manager for Niue Power Corporation, Niue

Evaluation

Solomone in my observation you have done well in running the workshop and its very useful for me.

Presentations

Presentations was well presented by all the participants covering RE's in their countries the success and the failures and also other related areas that is important and I believe that it helps us in looking ahead with the RE's that is coming up and to plan for it.
RE has taken another good step in my opinion because we have now moving on to the big things like grid connected installations and later on will be the storing of RE's.
Its amazing to see and to share with others about their applications on RE's.
I like the way that you have done it just to give to the PI's.
This workshop has certainly help me on our REP-5 stuffs and also PIGARREP side of things.

Future Plans

From this workshop I have already make some commitments for two of my staff to travel to Tuvalu on the second week of May to look and learn something from Tuvalu's PV Grid Connected System.
Its is good too to see various utilities general managers attend this workshop.
In the past Niue did not share much in RE's because there is not much to share but in the near future I am sure I will have more to share because we are now installing some RE's in REP-5.
I believe that regional organisation should have some set of rules/regulations in order for the PI's to follow and for the supplies to comply to.
It looks like that you do not have anyone there to help you with the administration side of things but you manage it well.

Last but not the least I would like to extend to the hosting country, Jesse, Seru and others a big thank-you for their hospitality for us while we are in their homeland.

Looking forward for future workshops to assist PI's in our RE's.

Well done Solomone
Fakaue Lahi

Ali Toara Makaita, Bushland Farmer, Lambubu, Malekula Island.

Participants: All Pacific Islands States

My Objectives: Research of Mini Hydro Stream Generating Engines

For some years, I have been trying to find some kind of mechanism to be used to convert the water springs energy into some useful means in my farmland.

In the 1990s, I installed the water supply systems with a 600 litre tank capacity as a header service tank / storage. Run the 45 mm ϕ polythene pipe to our small village, at distance of 2 kilometer down with a water pressure of 30 kg per square meter.

I left my farm at the end of February 2008 for Vila purposely to make some more research on mini hydro stream engines.

Now it happened that whatever plans we may make in reference with God, there is always a way.

As I have said during my presentation, I am an uninvited guest in the workshop. Attending the workshop from the start, I am really impressed. And I learnt plenty from the presentations presented by all the SIS participants.

But very sad, I am afraid to admit on the Vanuatu side – they talk plenty, talk big and expect big things to take place first. While rural remote areas with over 80% of the population still lives with no electricity where there are reliable sources. As virgin water springs could be used to serve the needs of providing electrification for these poor people.

Above all, regarding my instant participation, I am recommending that people from remote rural areas should be invited to attend these type of particular workshops because they are the ones facing the hardships of life livings – yet supporting the country's economic developments. They have resources on their lands – yet they do not know how to utilize them.

The Solomon Islands presentations regarding the mini and some big hydro developments are some most very encouraging and should be an example to Vanuatu, Fiji and PNG.

Participating in the workshop has given me some more information how and who to approach for my hydro development project.

I am here thankful to you all participants for sharing the ideas regarding renewable energy technology applications.

Wish you all safe journey back to your various home countries and do not forget to bring with you our best wishes from Port Vila, Vanuatu.

Terubentau Akura, CEO, Kiribati Solar Energy Company Ltd, Kiribati

Overview

The workshop is well organized and the venue is the right place. The organizer did present well the overview of the workshop and the main economic, social and environmental issues to address by all pacific island states regarding the heavily dependence on imported fuel. Presenters clearly indicate a true overview of their own respective renewable based projects which is something that everyone can understand the incentives which drives them to do all sorts of incentives, learn different types of problems they came across during the implementation phase of the projects and interestingly learn how they resolved such issues and determine to advance forward into the future.

The rapport among the participants has been very impressive. The participants willingly share their respective experiences and problems from which the rest have the opportunity to get the firs hand information from each of the participants. Among the issues discussed were the need to put in place sound energy policies, regulations at the national level, good networking and co-ordination among the implementing agencies and the need to have research and developments that will focus on the renewable based technologies.
The workshop has broadened my knowledge and understanding on PV – Grid connected systems, bio-gas and bio-fuels. These are the areas which I have great interest in and also the main driving force for me to attend. Do I get the information I need? My answer is Yes. It is not that I have learned everything of such technologies but at least I have gained a broader knowledge and perspectives and that is all I need in order to advance not only my PIGGAREP activities but as well as other renewable initiatives in my home country.
Commitment that I must do when I go back to my home country:

i) Complete my PAS with regarding to PIGGAREP and I should complete them by first week of May.
ii) Initiate as many projects as I can submitted to the government based on renewable and grid connected and energy efficiency
iii) Beside the utility concept that has been going well in Kiribati, KSEC Ltd have initiated the possibility of encouraging the private sector to boost the expansion of solar-based rural electrification. Coinciding well with the SOPAC REEP LUTW project, I advance the design and implementation a pilot project based on the “loan to own” solar lighting systems. I must do this prior the implementation of the EDF10 as I am anticipating including smaller and affordable solar home systems along side the existing solar utility. In this way I think we can have a full coverage of electrification and customers can have a variety of options to choose from. The solar utility which tariff ranges from A$5 to A$60 plus a loan to own systems. I

have discussed this initiative with David Iro of the Solomon Islands and we agreed to create a good business relationship between our two companies.

iv) The workshops have encouraged me to press on with the study of bio fuel for small generators and I will discuss this idea with Energy Planner, advisers and aid donors. There is a need to broaden KSEC LTD activities on the outer islands beside solar. The generation of electricity from bio-fuel generators

v) Energy Efficiency is one that can be implemented and will achieve major impact in the reduction of the fuel consumption in the power house on South Tarawa. We have put this under EDF10 and KSEC LTD will implement energy efficiency activities on the outer islands. I will expand the

vi) Using Coconut and Diesel in small generators is not yet been tried in Vanuatu. It is good to hear that UNELCO has a plan to put this on trial in the future. The success of this project will greatly benefits Kiribati. It Is very unfortunate that CEO from Kiribati Public Utilities Board could not attend this workshop as I believe he will learn a lot from it.

The accommodation is very comfortable and has plenty of space. The arrangement of flight bookings were implemented effectively even to the fact of limited time. The organizing of joint dinners have great impact on building closer ties among participants. For all the efforts, time and energy and also dedication of organizing institution, I owe to state herewith my heart felt gratitude and appreciation to Solomone Fifita and his PIGGAREP staff. In addition, I would also like to thank Rupeni Mario for presenting an overview of energy related activities in the Pacific region.

Thomas Star, Utilities Policy Officer, Nauru

The workshop was opened by Hon Carlot Korman, Minister of Lands and Natural Resources. I think that the workshop was treated with importance because of the opening done by the Minister.

Considering the different strata of renewable energy, I was quite excited to see the Pacific Islands very proactive in their approach. If it wasn't for Solomone Fifita and Rupeni Mario being active, I think Nauru would have been left out.

Each renewable project serves it own purpose and gathering information and technical experience by the other countries seems to boost each country. With the field trip to Efate, the biogas project by them to supply cooking and lighting was superb.

I guess some pressing issues would be the clash of government and government/private sector in policies regarding payments of utilities bills. One method was for donor countries restricting support to government.

One of the main projects that caught my eye was the presentation Grant Behrendorff of Bush Light. It is quite amazing on how the project can must indigenous people and educate them in RE grid connected.

The projects currently undertaken by Kiribati and Tonga would be important in Nauru's perspective because as drought is normal at the moment, water is scarce. The drought situation coupled with the 6 hours on and 6 hours off restrict people from water access which results in hygiene and sanitary (toilets).

Comments
I was surprised that there was no presence of Forum Secretariat, SPC and other agencies to support Solomone, only SOPAC sent their rep which was Rupeni Mario who is very supportive in the workshop.

Recommendations
There should an annual meeting of this sort so each country can maintain stock inventory of such projects, but overall, Solomone has done good job in both logistics and supervising.

Tupa Nooroa, Generation Manager, Te Aponga Uira, Cook Islands

Introduction

Prior to being invited to come to this workshop, I have had had no earlier experiences or connections to such programs. I was not the original participant invited but my Chief Executive Officer. However, due to other commitments he instead asked me to represent the Cook Islands and I gladly accepted this opportunity to participate and hence my being in Vanuatu.

Expectations

Apart from SPREP and SOPAC, it was a bit disappointing not to have other organizations to be part of this workshop especially if they have been invited. As the hosting country for the PPA Conference this year, I would like to have met with a representative from PPA. However, apart from this I have enjoyed this workshop and the experiences gained will no doubt be beneficial to my country. And one of the highlights of this program was the presence of the Hon. Minster for Land Resources, Mr. Maxime Carlot Korman to open the workshop, and I being asked to reply on behalf of all participants.

Program Set Up

The first two days of the workshop was held in a well spacious room with air conditioning and very accessible to convenience amenities. There was room to spare and the atmosphere was great and comfortable. I only felt a bit uncomfortable when we relocated to the second room for the duration of the program especially the smallness of it to accommodate a fair number of people. This was also coupled with some hygienic matters especially body odor and within a small room, it was easily felt. This was the only negative experience for me.

Program Delivery

I felt that most participants delivered their presentations professionally. The concept to exchange ideals, experiences and knowledge was really enlightening and has given me a broader approach to other RE resources that my country have started but failed in the past. Some of the failed and success situations of another country had really helped as a solution and further progress for another.

The organizers were also very prompt and professional in delivering the programs. Another highlight is the inclusion of field trips as part of the program. All site hosts were also very helpful in explaining and answering questions in regards to their projects. The mixture of classroom and site visits in itself is a success.

Other Matters

Accommodation
The Melanesian Hotel is very nice and the rooms are comfortable and served the purpose.

Accessibility
The hotel is very close to a super market and other grocery shops and choices are available.

Transportation
Always available and cheap compared to other places.

Recommendations

i) I believe that the way forward in RE is to keep this kind of workshop an on-going program.
ii) There must be a set up to ensure that contact can easily be made amongst participants and organizers to keep the flow of information.
iii) Early notification to participants to such workshops must be timely.
iv) Participants must be fully prepared when attending.
v) Commitments by participants while in attendance must be a priority.
vi) Accommodating all participants in one hotel will be helpful.

Conclusion

The workshop has indeed been a success. The sharing of experiences and knowledge was readily straightforward and beneficial to everyone. The acceptance of the un-invited rural participant that required information about mini-hydro dams was emotional and moving to me. From this I see that the organizers are very committed to any RE development and would welcome others concerns as well. This also shows that there are other people outside there that need assistance to develop the readily available natural resources in their own backyards.

The overall result for me is the knowledge gained that would benefit the Cook Islands as a whole. It is also good to know that there is a wealth of knowledge and information outside there amongst SIS that I could easily access and tap on to.

Lastly, I would like to thank everyone that shared and participated in this workshop and hope we deliver when it is required.

Acknowledgements

i) I would like to thank my CEO – Tereapii Timoti for giving me the opportunity to attend this workshop on behalf of the Rarotonga Power Authority and the Cook Islands as a whole.
ii) My gratitude also goes out to all the participants that shared their ideals and experiences with me without hesitation.
iii) To Rubeni Mario of SOPAC for the assistance rendered me in my presentation and mainly his immense contribution to the workshop in all aspects.
iv) Lastly, but importantly, to Solomone Fifita, who made this workshop a reality. His abilities in organizing and delivering the workshop have not only been felt by me but by other participants as well. Since day one in making contact, I have never been left out. Truly, a professional in his field of work. Thank you Solo.

Winnie Veikoso, Energy Officer, Tonga

Workshop Venue and Accommodation:

Very Good! Workshop venue and accommodation was convenient and satisfactory. Price for my accommodation was very reasonable and clean facilities, a beautiful garden not forgetting the hospitality and fantastic hospitality of the workers.

Workshop Programmes and Lesson Learned:

I learned about biofuel and how does it work in theory and in real projects. After the presentations from UNELCO and the visit to the power plant visit that is run with 25% biofuel it was a great experience to me. I learned that to get a better and full reliance on RE technology, is to take all the risks and the good technology is not always the cheap one. With that I would like to congratulate UNELCO their courage and motivation that nothing is impossible.

I also learned that RE cannot be a burden to the community otherwise they still prefer to remain in the past and live happily with what ever they currently have. For a RE project to work out, the community have to fully understand (by using community language and examples) the project and accept it fully in order for a RE project to work out because community cooperation is very much needed. Close monitoring and well clear management regulations and administration needed from all level and stakeholders to all RE projects in the Pacific.

I learned that maintenance is a very important component of every RE project. As the presentations from various RE project in the Pacific most RE technology worked out in the Pacific but monitoring, technological skills and maintenance money went missing and mostly not cover by the project donors. Therefore cost for maintenance should always allocate and signed together with the project installation in the first agreement of the donor and the receiver.

Site Visits:

Very punctual time traveling to and from field trips with very kind and friendly welcome from the various places visited (especially UNELCO). Very good experiences visited failed and on going RE projects and to see it with your own eyes is a different experience.

Participant:

I found my fellow participant more like families and friends, may be because I am the only female (unfortunately) and especially I was sick most of the time but they did visit me and give me good company.

Host Country:

Vanuatu is a beautiful country and full of renewable resources. The local people I found them very friendly and supportive. Never been a better country for this workshop but here in Vanuatu, not only they lead with biofuel projects but other renewable energy as well such as wind and biogas.

Organizer:

Very Good and Satisfactory. I would like to acknowledge my appreciation for the organizers and donors for enabling this workshop and for me to participate and learn and build my capacity with RE projects in the small Pacific Countries.

General Comment:

Overall this workshop was well planned and everything was alright for me though that I spend most of the time in bed very sick (hell of an experience).

Thank you for everything.

Benjamin Jesse, Acting Energy Planner, Vanuatu

Vanuatu Evaluation Report

The SIS Capacity Workshop on Renewable Energy Technology is a very rewarding workshop as it provides an opportunity for country participants to share experiences and lessons learned from the implementation of previous projects.

Participants

The participants were well selected, as it comprises mainly of senior policy makers, general managers of power utilities who are directly involved with renewable energies, members of CROP agencies and renewable energy business owners. All the participants were very kind, which adds to the successfulness of the workshop.

Presentations

The presentations were excellent and very comprehensive. Presentations cover:

- Background to the project / programme being presented
- The technical, institutional and financial design of the project / programme
- The technical and financial performance of the project / programme
- The productive applications of the energy services provided by the project / programme
- How the community has benefited from the RE project / Programme

As part of the presentation, the weaknesses and strengths on the technical, institutional and financial design of each project were outlined. All the presentations during the workshop were of high standards that all were blessed and it believed that many lessons were learned from the presentations by the participants.

Site Visits

Site visits were the most interesting part of the whole workshop. Like the saying goes ' seeing is believing'. Participants have the chance to see and learn of UNELCO's biofuel development and wind development.

The visit to the UNELCO's power station was very remarkable as the UNELCO engineers explained in details how they utilized biofuel (coconut oil) in their main 2 x 4MW generators to generate power. The visit to the wind farm is also exciting as the participants actually see in reality what was presented during the workshop. The future of the wind farm was also explained in detail at the site which adds value to the overall presentation.

Not only to the renewable energy project sites but a round island trip was also enjoyed by the participants to visit potential renewable energy sites and also to historical sites.

Social Events

It was unforgettable how the participants get to interact with each other more informally. Members tend to talk to each others more freely without worrying about their official designations. Steak nights were the highlights of the week. Participants put in cash to buy steak, drinks and other foods for BBQ and everything was awesome.

Conclusion

All in all, the workshop was one of the most outstanding one I have attended. All the planned activities and programs for the project were all carried out. The workshop was well organized, successful discussions and recommendations have been made during the workshop and as a result all benefited from the workshop at its closing. It has to be admitted that the host country feel honored and blessed as the host of the RET workshop.

6. The Organizers' Evaluation of the Workshop

SIS Capacity Building Workshop on Renewable Energy Technology Applications

Melanesian Hotel, Port Vila, Vanuatu
21st - 25th April 2008

Solomone Fifita, Manager – PIGGAREP, SPREP, Apia
(solomonef@sprep.org)

The Workshop's Evaluation

Your Evaluation

Organisation

- Very good
- More people in the Secretariat
- Email etc

Venue

- OK

Programme

- Excellent
- Balanced mixed of presentations and field visits

Participants

- Excellent
- Good mix of govt, power utilities, NGOs and private sector
- Aust experience was good

Non-PICs

- Appreciated Rupeni's / SOPAC's contribution
- Where are the other agencies like PPA, Forum, etc?

Per Diem / DSA

- Calculations

Next Steps

- Follow-up event

The PIGGAREP PM's

Evaluation

What can we do to move

the RE agenda forward?

1. Leadership
2. Vehicle
3. Business

Leadership **Identify Champions!**

Look beyond one's stomach and pocket!

He'll break the chairs and fix the girls. No!

Encouraging the use of more fossil fuel. No!

Cell Phone ring tumas. No!

Not when the Air Tugaru is flying!

I am homesick and bored! No!

Tok tok too slow. No!

Sick on Mon ..

Present & cough on Tues ...

No!

Where is the Beer on Wed!

Sorry but I can't stand! No.

The Man!

Poking his nose where it is not supposed to be

The Man!

"He read about it, he stood up and followed it ....."

1. Leadership
2. **Vehicle**
3. Business

Keep the network alive ….

Business

- Innovative ways of doing business
- Readily adapt to the changing circumstances

Key Messages

- No one size fits all
- Learn by doing
- There are successful and not-so-successful stories – no failures
- The opportunities are out there
- Go and get them!


SPREP
Secretariat of the Pacific Regional Environment Programme
Working together to renew the Pacific's future
PIGGAREP
SPREP
UNDP
GEF


SPREP
Secretariat of the Pacific Regional Environment Programme
Safe Travels
'Ofa atu
PIGGAREP

7. Follow-up Activities

The workshop directed the PIGGAREP to follow-up on two key activities for 2009:

- Establish some kind of network where renewable energy practitioners from around the PICs can share their experiences and help each other effectively and efficiently

All too often people come across various problems in their daily dealings with renewable energy. This may be technical, financial or administrative in nature. The idea then is for people to be able to post a question or a call for information to fellow colleagues in the network and to be able to get some assistance or information from others in the network. For instance, a technician in the Marshall Islands may be experiencing some problems with a particular type or model of solar battery. The Marshallese technician can post his/her question to others in the network and those who have experiences with the same type of batteries can share their experiences and provide advise on how to deal with the situation.

- Conduct a regional training workshop on the designs of grid-connected and hybrid RE systems and establish a standard for grid-connected and hybrid RE systems installations and components

One of the identified shortcomings of the stand-alone renewable energy installations, like solar home systems, is their limited power outputs and applications, which are mostly restricted to lighting only. There is therefore the appreciation that combining two or more energy conversion devices or two sources in one device can address limitations in terms of fuel flexibility, efficiency, reliability, emissions and / or economics. At the same time, there are calls to open up the power generation markets and allow independent power producers to generate and sell to the grid.

There is an obvious growing number of grid-connected RE systems that have either been installed or planned to be installed in the PICs. The Tuvalu Electricity Corporation has installed a 40 kW grid-connected PV system early this year. It is understood that there are similar installations at the ANZ Bank at Christmas Is, Kiribati (18 kWp) and the ANZ Bank at Aitutake Atoll, Cook Islands (18 kWp). Under the European Union funded renewable energy programme for 5 PICs (REP-5), the following are planned:

- A grid connected PV system is to be installed on a public building in Niue. Capacity of the system is to be 35 – 55 kWp with an estimated budget of 400,000 Euro.

- A 40 kWp grid connected PV system is to be installed at Nauru College in Nauru with an estimated budget of 500,000 Euro. The PV system is to be maintained by the Utility, and monitored by the Energy Efficiency Officer.

- 100 kWp grid connected PV at the Capitol complex car park at Palau with an estimated budget of 1,040,000 Euro. Contract was signed in early March, construction to begin by June and commissioning by October 2008.

- Installation of off-grid PV systems. Two mini grids to be installed in Yap in Ulithi Atoll with 42 kWp total. At Chuuk public buildings on 3 islands (Onoun, Satawan & Moch) to be electrified with 24 kWp total. At Pohnpei - schools and dispensaries in 5 islands (Sapwaufik, Nukuoro, Mwoakilloa, Pingalap, Kapimarangi) to be electrified with 45 kWp total. Contractor has been selected. Contract was signed in March. A total budget of 1.5 million Euros.

- Grid connected PV system with a peak power of 45 kWp is to be installed on the utility grid at a cost of 375,000 Euro with the Utility being responsible for maintaining the system. Contract was signed in early March, construction to begin in June and commissioning by October 2008.

With the new EDF 10 and the Italian-funded energy programmes, more grid-connected renewable energy installations are expected and the PICs must be equipped with the skills and knowledge to design, implement, monitor and maintain these systems but also to have the appropriate regulatory tools and standards in place.

8. The Workshop's Financial Report

SIS Workshop Costs Summary	
Programme Support	3,555.27
PICT Training/Workshops - Airfares	24,247.95
PICT Training/Workshops - Perdiems	29,122.00
PICT Training/Workshops - Other related costs	4,535.00
In-country Assistance - Airfares	722.84
In-country Assistance - Perdiems	1,793.00
TV documentary	12,979.06
Total Expenditure	**76,955.12**
Taiwan	**50000.00**
PIGGAREP	**26,955.12**

Annex 1: Opening Speech

By Hon. Maxime Carlot Korman, Minister of Lands and Natural Resources, Government of Vanuatu

On the Occasion of the Small Islands States Capacity Building Workshop on Renewable Energy Technology Applications, Melanesian Hotel, Port Vila: 21st April 2008

Distinguished delegates
Representatives of CROP agencies
Representative of the Secretariat of the Renewable Energy and Energy Efficiency Partnership for South East Asia and the Pacific
Mr Benjamin Jesse and staff of the Vanuatu Energy Unit
Representative of UNELCO and other agencies in Vanuatu
Ladies and Gentlemen

First of all let me say Welcome to Vanuatu to all our foreign guests. I sincerely hope your visit will be an enriching one professionally and also give you the opportunity to experience our culture, our environment and our people.
It is indeed an honour for Vanuatu to be selected to be the venue for this very important workshop. I understand that this workshop is mostly for the Small Island States of the Pacific. It would have therefore been more appropriate to have it in a Small Island State like the Cook Islands or Kiribati. However, I understand from the organizers of this workshop that Vanuatu has been selected as the venue because of its interesting renewable energy developments, in particular our biofuel, wind power, hydropower and solar power developments. The Vanuatu government is therefore pleased to be of some assistance to our smaller sister nations of the Pacific. I understand that representatives from Papua New Guinea and the Solomon Is are also assisting with this workshop. I strongly believe that this is what the "Melanesian Spirit" is all about and equally this is what the "Pacific Way" is all about.

The Pacific Islands must always stand united and work hand-in-hand to address the challenges that it face. One of these challenges is Climate Change, a priority global issues that has consistently featured and discussed at the annual summit of the Leaders of the Small Island States and at the meetings of the Forum Leaders.

The world is currently trying to address Climate Change through adaptation measures and reducing the emissions of greenhouse gases. We all know that the region's greenhouse gas emission is insignificant compared to other regions of the world. We also know that the Small Island States of the region are among the most vulnerable to the impacts of climate change. But the dilemma we have is that while we are the most vulnerable, we are also heavily relying on fossil fuel, which produces most of the greenhouse gas emissions, which is responsible for climate change. So while we are most vulnerable physically to the impacts of climate change, our small economies are equally most vulnerable economically to the prices of fossil fuel – which has now reached US$100 per barrel.

But the Pacific is also the region with the highest renewable energy potential per capita in the world. We are in the midst of the largest ocean on earth with its unlimited wave, tidal and ocean thermal energy. We are scattered around the Tropics where the sun always shine, there are flowing water and the climate is conducive to the planting of energy trees. The tropical wind is always blowing and we are along the Pacific Rim of Fire with its potential for geothermal power generation.

The challenge we have, therefore, is to participate in the global effort to reduce greenhouse gas emissions in such a way that will also advance the region's other sustainable development effort. It therefore makes sense that our region work towards harnessing more of our renewable energy resources and at the same time facilitate the access to clean, reliable and cost-effective energy sources for our manufacturing and service industries, water supplies, health services, education, transportation, telecommunication and etc.

Here in Vanuatu, it is reported that it is only about 25% of our people that have access to electricity. The Vanuatu government has therefore made an undertaking in 2000 to become a 100% renewable energy economy by 2010. It may be an over ambitious undertaking but we are going to review this and continue to explore sustainable options for bringing electricity to our people through clean renewable energy sources.

I understand that general managers and senior officers from the power utilities in the Small Island States are participating in this workshop and I must particularly thank UNELCO for its willingness to share its renewable energy experiences with its sister power utilities in the region.

Over the last twenty years, the Pacific Islands have been flooded with various programmes on renewable energy. We have the Global Environment Facility, the World Bank, the Asian Development Bank, the European Union, the Italian government, Australia, France and our very own regional and national agencies. While significant improvements had been made, the overall progress has been rather slow. I am therefore glad that your workshop will diagnose the barriers to the development of renewable energy in the region. You all have your own successful and not-so-successful stories. It is through openly sharing these stories and collectively finding ways of practically addressing them that we can accelerate the penetration of renewable energy in our respective countries.

I wish to thank SPREP for organizing this very important workshop. I wish you all the best in your deliberations and visits to some of our renewable energy projects. As I said earlier, do take time out to enjoy Port Vila and Efate.

It is now my honour to declare this Small Islands States Capacity Building Workshop on Renewable Energy Technology Applications open.

Thank You

Annex 2: Participants' List

	Name	Profession	Characteristic of Employer	Male / Female
1	Mr Nooroa Tupa Manager, Generation Te Aponga Uira Rarotonga **COOK IS** nooroat@electricity.co.ck	Engineer	Power Utility	M
2	Mr Terubentau Akura CEO Kiribati Solar Energy Company Ltd Tarawa **KIRIBATI** terubentau@gmail.com	Chief Executive Officer	Solar Utility	M
3	Mr Witon Barry Operating Manager TOBOLAR **RMI** Phone: 692 625 3116 Fax: 692 625 5749 tobopp@ntamar.net	Engineer	Copra Oil Mill	M
4	Mr Thomas Star Utilities Policy Officer Nauru Utilities Authority **NAURU** alphanru@hotmail.com thomas.star@naurugov.nr	Policy Adviser	Public Utilities (Power, Water and Fuel Tank Farm)	M
5	Mr Speedo Hetutu General Manager Niue Power Corporation **NIUE** gm.npc@mail.gov.nu	General Manager	Power Utility	M
6	Mr Greg Decherong Program Manager Palau Energy Office Ministry of Resources and Development **PALAU** energy@palaunet.com	Energy Adviser	Government	M
7	Mr Tomasi Tafia General Manager Tokelau Power	Engineer	Power Utility	M

	Name	Profession	Characteristic of Employer	Male / Female
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8	Mr John Bosco Penehe Chief Engineer Tokelau Power **TOKELAU** Phone: +690 3124 / +690 3130	Engineer	Power Utility	M
9	Mr Mafalu Lotolua General Manager Tuvalu Electricity Corporation Funafuti **TUVALU** mlotolua@yahoo.com.au	Engineer	Power Utility	M
10	Mr Joseph Dar Project Manager - Tutuwe mini-grid Project, TSLP & SEFP PNG Sustainable Energy Ltd **PNG** Joseph.Dar@pngsel.com	Engineer	Power Developer / Investor	M
11	Mr David Iro Willies Electrical Honiara **SOLOMON IS** dif@solomon.com.sb	Engineer / General Manager	Private Sector Power Developer, Investor and Consultancy	M
12	Mr Andrew Daka General Manager Solomon Is Electricity Authority Honiara **SOLOMON IS** adaka@siea.com.sb adaka2008@gmail.com	Engineer	Power Utility	M
13	Ms ‘Emeline Veikoso (Winnie) Energy Officer Ministry of Lands, Environment and Natural Resources	Energy Planner	Government	F

	Name	Profession	Characteristic of Employer	Male / Female
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14	Mr Benjamin Jesse Energy Officer Energy Division Ministry of Geology and Mineral Resources Port Vila **VANUATU** Mob: +678-40143 benjaminjes@gmail.com	Engineer	Government	M
15	Mr Seru Sinumila Energy Office VANUATU	Engineer	Government	M
16	Mr Kalpapau Mangawai Energy Office VANUATU	Senior Solar Technician	Government	M
17	Mr Jerrie Wilson Energy Office VANUATU	Solar Technician	Government	M
18	Mr John Chaniel Managing Director UNELCO **VANUATU** john.caniel@unelco.com.vu	Engineer	Private Power Producer / Power Utility	M
19	Ms Willie Karie UNELCO **VANUATU** willie.karie@unelco.com.vu	Senior Administrator	Private Power Producer / Power Utility	M
20	Mr David Stein VANREPA Port Vila **VANUATU** davidstein@vanrepa.org	Project Manager	NGO	M
21	Ms Sophie Scott Live and Learn Port Vila **VANUATU** +678 66820 sophiescott16@hotmail.com	Trainer	NGO	F
22	Mr Johnety Jerety TV/Video Consultant Port Vila	Teaching	Private Consultant	M

	Name	Profession	Characteristic of Employer	Male / Female
	VANUATU jjerety@yahoo.com.au			
23	Mr Ali Toara Makaita Ameli Station **VANUATU**	Engineer	Villager / Resource Owner	M
24	Mr Jerome Sudres Vergnet A/S j.sudres@vergnet.fr	Engineer	Private Sector wind power consultancy and supplier of wind power equipments	M
25	Mr Grant Behrendorff Group Manager, Business Development Centre for Appropriate Technology Cairns **AUSTRALIA** grant.behrendorff@icat.org.au	Engineer	Private Sector Consultancy	M
26	Mr Rupeni Mario Energy Adviser Community Lifelines **SOPAC** Suva Fiji rupeni@sopac.org	Adviser	Inter-governmental	M
27	Mr Solomone Fifita Project Manager – PIGGAREP **SPREP** Apia Samoa solomonef@sprep.org	Adviser / Project Manager	Inter-governmental	M