Energy Efficiency & Renewable Energy Strategies in the Pacific Islands Countries

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Photo: Ankita Raturi
Pacific Island Countries

Population density
PNG - 8 persons/km²
Tuvalu - 363 persons/km²

No. of islands/country
PNG ~ 1,400
Fiji ~ 332
Kiribati ~ 33

Population
PNG – 7 Million
Niue - 2,150 (est)

Land Area
PNG – 462,243 km²
Nauru - 21 km²

Kiribati: North to South distance: 800 km
East to West: 3,218 km (3 time zones)
Electricity Access
PIC Electricity generation

Cook Islands: All Diesel
FSM: All Diesel
Kiribati: All Diesel
Marshall Islands: All Diesel
Niue: All Diesel
Palau: All Diesel
Tuvalu: All Diesel
Tokelau: All Diesel
Tonga: All Diesel
Vanuatu: 93% Diesel

PNG: 35% Hydro, 39% oil, 25% Natural gas

Source: PIREP report
FEA Electricity generation

1990: 94.5 % from hydropower
2003: 67.3 % from hydropower

Currently almost 50% is produced using diesel (Fuel bill ~ 98 M$/y)
Fiji Electricity Tariffs

FEA national tariff : 0.2059$F/kWh

Rural rates are being subsidized by urban consumers

**FEA actual costs (2001)**

<table>
<thead>
<tr>
<th>Location</th>
<th>Actual cost</th>
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<tbody>
<tr>
<td>Viti Levu Urban</td>
<td>0.19 $F/kWh</td>
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<tr>
<td>Viti Levu Rural</td>
<td>0.51 $F/kWh</td>
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<tr>
<td>Vanua Levu Urban</td>
<td>0.40 $F/kWh</td>
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<tr>
<td>Vanua Levu Rural</td>
<td>1.22 $F/kWh</td>
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<tr>
<td>Ovalau Urban</td>
<td>0.38 $F/kWh</td>
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<tr>
<td>Ovalau Rural</td>
<td>1.88 $F/kWh</td>
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</tbody>
</table>
Petroleum imports and consumption


Per capita consumption

Palau Government capital Complex

Kumul marine Terminal, PNG
Petroleum Supply (Tuvalu-2005)

Petroleum is supplied once every two months

There are times when the country runs out of petroleum products
Kerosene based lighting

About 90% of the people in PNG use kerosene for lighting

~ 35 Million Liters/ year ~ 98 M kg of CO$_2$ equivalent

A kerosene wick lantern produces~ 1 lux (lumen/m$^2$) at 1 m distance

Used 4 hours/day a kerosene lamp emits 100kg of CO$_2$ annually.

Annual light output of a kerosene lamp = light produced by a 100 W incandescent lamp in 10 hours: **Highly inefficient**
Carteret Islands, PNG

By 2015: All 6 (7 now!!) Islands will be submerged. 2000 people displaced

The sea has dissected the Huen Island into two.

Similar stories in Kiribati, Tuvalu and others
Climate Change effects in PICs

Mount Jaya, New Guinea Island

Temperature increase on the Island ~ 0.3 Degrees every decade; Among the fastest in the world

Glaciers have receded more than 300 meters in the last 30 years

Flora and fauna: waiting to be discovered (if survive !!)

Malaria cases reported at an altitude of 2,100 m.
PICs are Tackling the challenges through:

- DEMAND SIDE MANAGEMENT
- RENEWABLE ENERGY DEVELOPMENT
EE policies in PICs

• Improve the efficiency of energy production, transmission, and distribution through demand side management.

• Introduce demand side management programmes for enhancing energy efficiency and conservation so as to reduce the energy consumption in government facilities, residential and commercial buildings, industry and forestry.

• Introduce minimum energy performance standards for electrical equipment, adoption of energy codes.

• Promote appropriate packages of incentives (including taxes, duties and tariffs) to encourage efficient energy use.

• Encourage co-operation in energy efficiency and conservation programmes between the private sector, consumer and governments by increasing public awareness and improving access to information.

• Promote the process to establish regional demand side energy targets.
Demand Side Management

Changes in the demand curve (load curve) by influencing consumer behaviour.

FEA: Excessive Reactive Energy Penalty: maintain a Power factor of 0.85
Efficacy comparison of light sources

- Standard Incandescent
- Tungsten Halogen
- Halogen Infrared Reflecting
- Mercury Vapor
- Compact Fluorescent (5 - 26 watts)
- Compact Fluorescent (27 - 55 watts)
- Linear Fluorescent
- Metal Halide
- Compact Metal Halide
- High Pressure Sodium
- LED (Red, Orange, Green, Blue, and White)

Lighting: 8.9% of World primary energy Consumption
8% of World CO₂ emissions
CFL Promotion in Fiji: DSM for Residential Sector

- FEA initiated and private sector supported
- Buy one and get one free scheme
- 80,000 units distributed
- FEA contributed F$1 per unit: payback period of one month
- Evening peak reduction: 3.9 MW
- Supplier contribution: F$0.82 per CFL, Profit: F$30,000
- Retailer’s contribution: F$1.05 per CFL, Profit: F$47,500
FEA CFL Promotion Outcomes

Source: FEA
## CFL Cost-benefit assessment

<table>
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<tr>
<th></th>
<th>5 Regular Bulbs</th>
<th>One Energy Saver Bulb</th>
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<tbody>
<tr>
<td>Purchase Cost (Capital)</td>
<td>40</td>
<td>5</td>
</tr>
<tr>
<td>Operation Cost to run 5000 hours</td>
<td>60</td>
<td>11</td>
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<tr>
<td>Total Cash Outlay</td>
<td>75</td>
<td>15</td>
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<tr>
<td>Savings</td>
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<td>% Savings</td>
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<td>$45</td>
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<td>$108.79</td>
<td>$21.62</td>
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</table>

**FEA calculations**
CFL Promotion

Photo: Ankita
CFL- Many brands available
Barriers

- Affordability; CFL Cost: 6-8 times the cost of an ordinary bulb
- Information
- Behavioural and preference
- Technical issues
Potential savings from DSM programme (1994-2013)

Energy savings (% of MWh generated)

Fiji | PNG | S.I. | Palau | Tonga | Tuvalu

Source: Conway & Johnston, 1995 (based on work of Felix Gooneratne of Forum Secretariat)
Standards and Labelling

Proposed standards for Fiji S&L programme

• Energy labelling: All household refrigerating appliances should be tested under standard conditions, and ranked on a 6-star scale according to their energy consumption.

• Minimum Energy Performance Standards (MEPS): set a legally enforceable level of energy efficiency

  Expected Benefit /cost ratio  4.2

  Electricity use reduction: 8 % below BAU
Projected Energy Savings

With Energy labelling and MEPS (1995 study)

Source: SRCI
Projected Savings under MEPS
Standards & Labelling

Energy efficiency labels for refrigerators and freezers.

FDOE recommended adoption of Australian Labelling programme guidelines.

Pilot programme started in 2002.

S & L programme in Fiji is supported by Australian Greenhouse Office, SOPAC and IIIC.
Labelling Awareness

Radio, TV and newspaper advertisements
FEA bills carry the message
Retailers distribute broachers
Appliances with and without labels are available

Consumer education needed
More than 54 countries have standards and labelling programmes

And It works!

Thailand case study

• Government spending = US$ 0.20 per household
• Energy bill saving = US$3.60 per household
• Net savings to Thai economy = US$ 0.90 per household
• Cost/benefit ratio: 4:1
• Carbon reductions = 0.9 Million MT of carbon

Source: CLASP
Expected benefits of S&L

• The value of the electricity saved by Fiji households as a result of purchasing more efficient refrigerators due to MEPS is estimated at FJD 163.4 million.

• From the perspective of the householder the benefits (energy savings) are about 4.2 times the costs.

Source: FDOE
Energy Audits

FEA offers energy audits to its customers. Some examples:

• The University of the South Pacific:
  Possible savings: 18%:
  Delamping, CFLs, Ballasts, Sleep mode in computer monitors

• Carpenters Service Center (Suva):
  Possible areas for energy savings: AC and lighting
DSM in Samoa

Supply Side Management: System losses reduction: Thermal scanning of distribution system, Old meters replaced by electronic meters.

Demand Side Management: Delamping, Efficient lights, AC adjustments

Public awareness campaign

- Residential load significant
- Lighting (>15%) and household appliances consume ~ 29% of total load
Energy Efficiency initiatives in the PICs

- ADB funded REEP: Opportunities for RE investment and EE project = institutional and capacity development
- UNDESA supported SOPAC project on DSM
- Promotion of environmentally sustainable transportation in the PICs: GEF funded SOPAC project
- Pacific Power Association (PPA): Supply side Management for its member utilities.
Renewable Energy Development
Solar Home Systems (Fiji)
Navutu (Fiji) 10 kW solar system

- Pilot project: BP Australia & FEA
- Grid connected
- Installed in 1997
- 50 kVA grid interactive system
- 144 panels
CNO Fuel in PICs: examples
Fiji Wind Farm

37 turbines: 10 MW, 11.5 GWH/year

Commissioned October 2007

Photos: Ankita Raturi
PNG Geothermal

Lihir Gold Mines: 56 MW Geothermal plant
First CDM project in PNG
White Light Emitting Diode (WLED) based lighting

- Efficiency ~ 100 lumens/watt (0.1 lumen/watt for kerosene)
- Solid state lighting
- Indestructible, lifetime - 100,000 hours, 30-40 years
- Very low power requirement: 1 watt WLED requires 80% less power than a CFL
- Connected to a rechargeable battery can be used anywhere
- Recharging: solar, manual (pedal power) etc.
Pacific Islands Energy Strategic Action Plan (PIESAP)

Policy 9: Efficiency & conservation

- Strategy 9.1: Analyse options for increasing efficiency.
- Strategy 9.2: Introduce DSM.
- Strategy 9.3: Introduce MEPS.
- Strategy 9.4: Promote appropriate incentive packages.
- Strategy 9.5: Encourage cooperation between private sector, consumers and governments. Increase Public awareness.
- Strategy 9.6: Establish regional demand side energy targets
Finally......

Energy Efficiency measures should be treated as the most reliable, cheapest and environmentally friendliest source of energy.

Development of any energy project should be complimented by Energy Efficiency/ Energy Conservation efforts.

or switch to CFL!!
THANK YOU FOR YOUR ATTENTION

www.energyforall.blogspot.com