



Benefits of Energy Efficiency in the Pacific Islands: ADB PEEP2 Project Results, Lessons Learned, and Next Steps

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Presentation Outline

- Project Overview
- Major Components
- Energy End Use Database
- Implementation of EE Programs – Results and Benefits
- EE Targets
- Training and Capacity Building
- Guidebooks
- EE Assessment Framework
- Recommendations and Next Steps

Overview of PEEP2

PEEP2 = Promoting Energy Efficiency in the Pacific (Phase 2)

- **Technical Assistance Project sponsored by ADB, in cooperation with the GEF, and the Governments of Australia and Japan**
- **Covered five Pacific Developing Member Countries (PDMCs) - Cook Islands, Papua New Guinea, Samoa, Tonga and Vanuatu**
- **Three-year program to promote and implement energy efficiency**

Project Components

COMPONENT	DESCRIPTION
1	Development of Energy Use Database
2	Development of Energy Efficiency Policies and Procedures
3	Implementation of Energy Efficiency Programs
4	Information Dissemination and Public Awareness

Major Outputs of PEEP2

PEEP II Overall Program Schedule



Key Outputs

- Energy Use Database (web-based)
- Establishment of EE Targets
- Energy Audit Training Program
- EE Building Codes
- Implementation of Replicable EE Projects
- Guidebooks
- Consumer Awareness Program
- Assessment Framework for EE
- Policy Recommendations

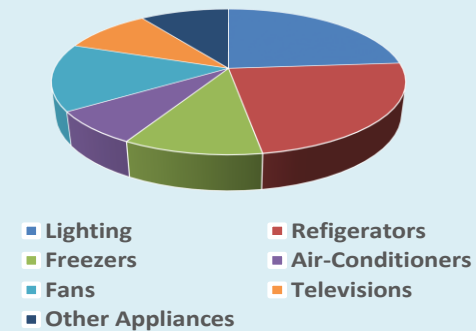


Energy End-Use Database

Energy Efficiency Data Base - www.ee-pacific.net

- First serious attempt at developing end-use data in the five countries
- Included surveys of residential, commercial and public buildings
- Provides useful information for EE policy and targets
- Allows benchmarking
- Easy to update
- Can be replicated in other Pacific countries

RESIDENTIAL ELECTRICITY CONSUMPTION BY END USE

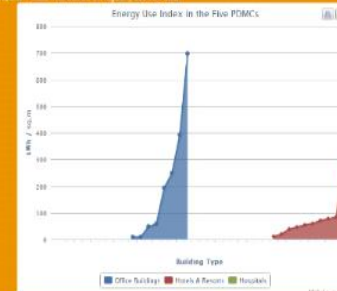


PROMOTING ENERGY EFFICIENCY IN THE PACIFIC (PHASE 2)

CONTACT US

HOME ABOUT US NEWS COUNTRY INFORMATION & DATABASE PROJECTS EVENTS PUBLICATIONS

By clicking on the data points, the graphic will show the values and the name of the building. By clicking on the legend at the bottom of graphic, you can select which data sets to visualize (i.e. which building sectors or countries). In addition, you can export the graphic in vector or raster format for use in presentations and reports. Please note that we will frequently add new data.





Project Implementation

Project Implementation

Street Lighting



EE Lighting in Public Buildings



EE Luminaires in Public Buildings



Resid. & Comm. Lighting



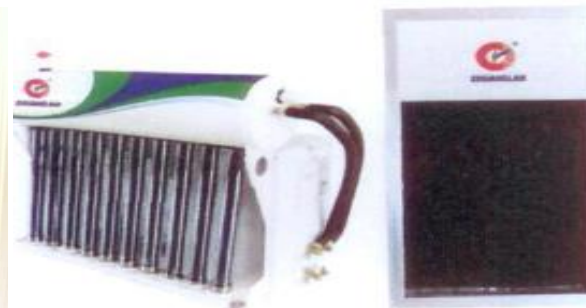
LED Lighting with Solar PV



Inverter A/Cs in Public & Hotels



Solar Hybrid A/C



Smart Controllers

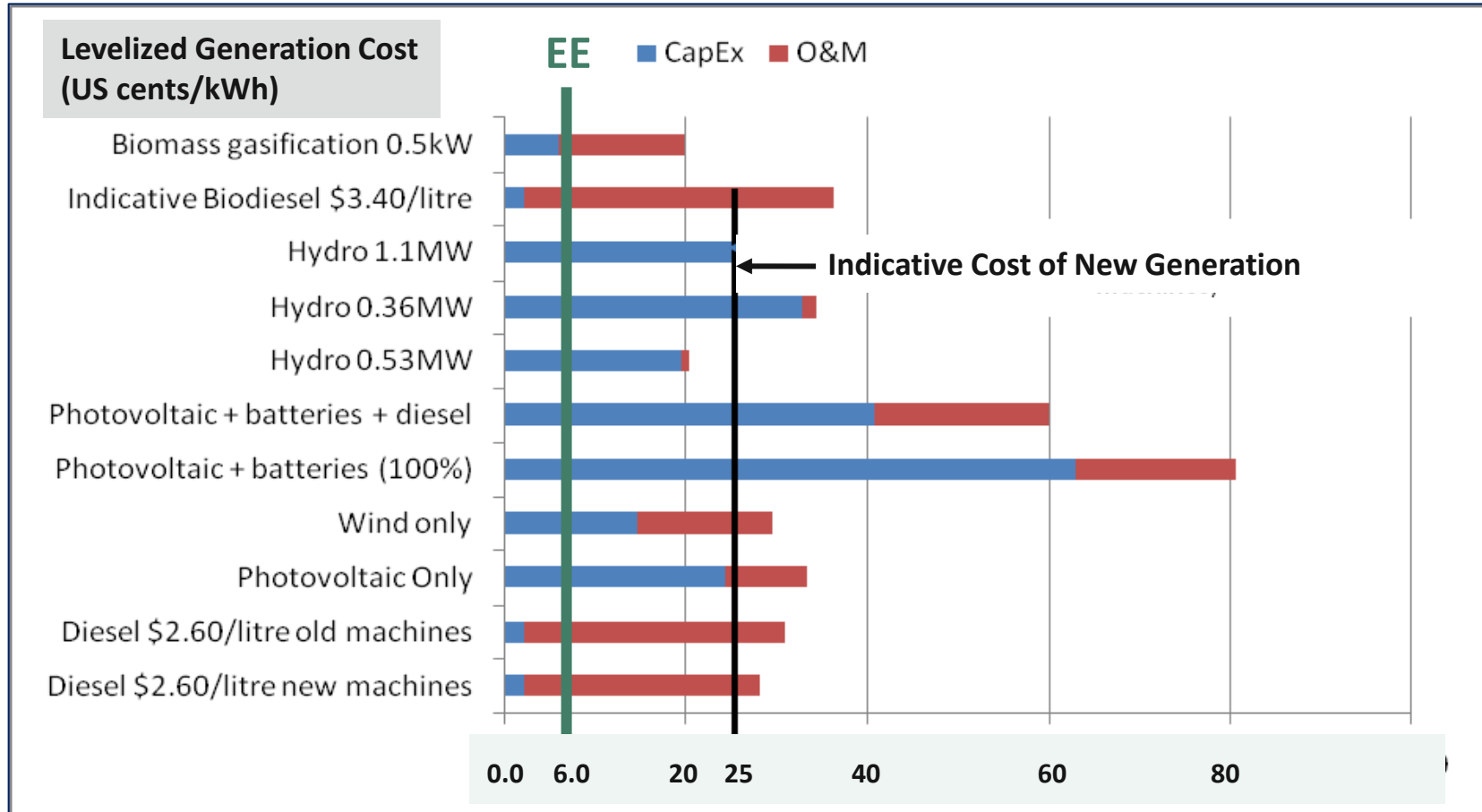


Also – EE Refrigerators/Freezers and Solar Water Heaters

Summary of Estimated Savings and Costs

COUNTRY	NUMBER OF PROJECTS	TOTAL PROJECT COST (000 US\$)	ANNUAL ENERGY SAVINGS (MWh)	LIFETIME ENERGY SAVING (MWh)	AVERAGE RETAIL TARIFF (US\$/kWh)	COST PER LIFETIME SAVING (US\$/kWh)	SIMPLE PAYBACK (Years)
COOK ISLANDS	9	765	525	6,899	0.61	0.11	2.4
PAPUA NEW GUINEA	5	497	428	4,077	0.29	0.12	4.1
SAMOA	7	520	919	8,922	0.45	0.06	1.3
TONGA	5	398	639	9,976	0.36	0.04	1.7
VANUATU	7	450	865	12,990	0.50	0.03	1.0
TOTAL	33	2,630	3,376	42,864	0.44	0.06	1.8

Indicative Costs of Energy Savings vs. New Generation



Benefits of Energy Savings – with Samoa Example

Target Savings by 2030 – 17% (~ 1% per year)

- Customer benefits – reduced bills: US\$ 26.6 million per year
- Generation savings: 32.4 GWh
- Diesel fuel savings: 8.5 million liters
- Reduction in peak loads: 6 MW
- Reduced investment in future generation capacity: US\$ 15 million
- Environmental benefits: GHG reduction: 21,000 Tons
- Improved balance of payment : ~ US\$ 10.4 million per year

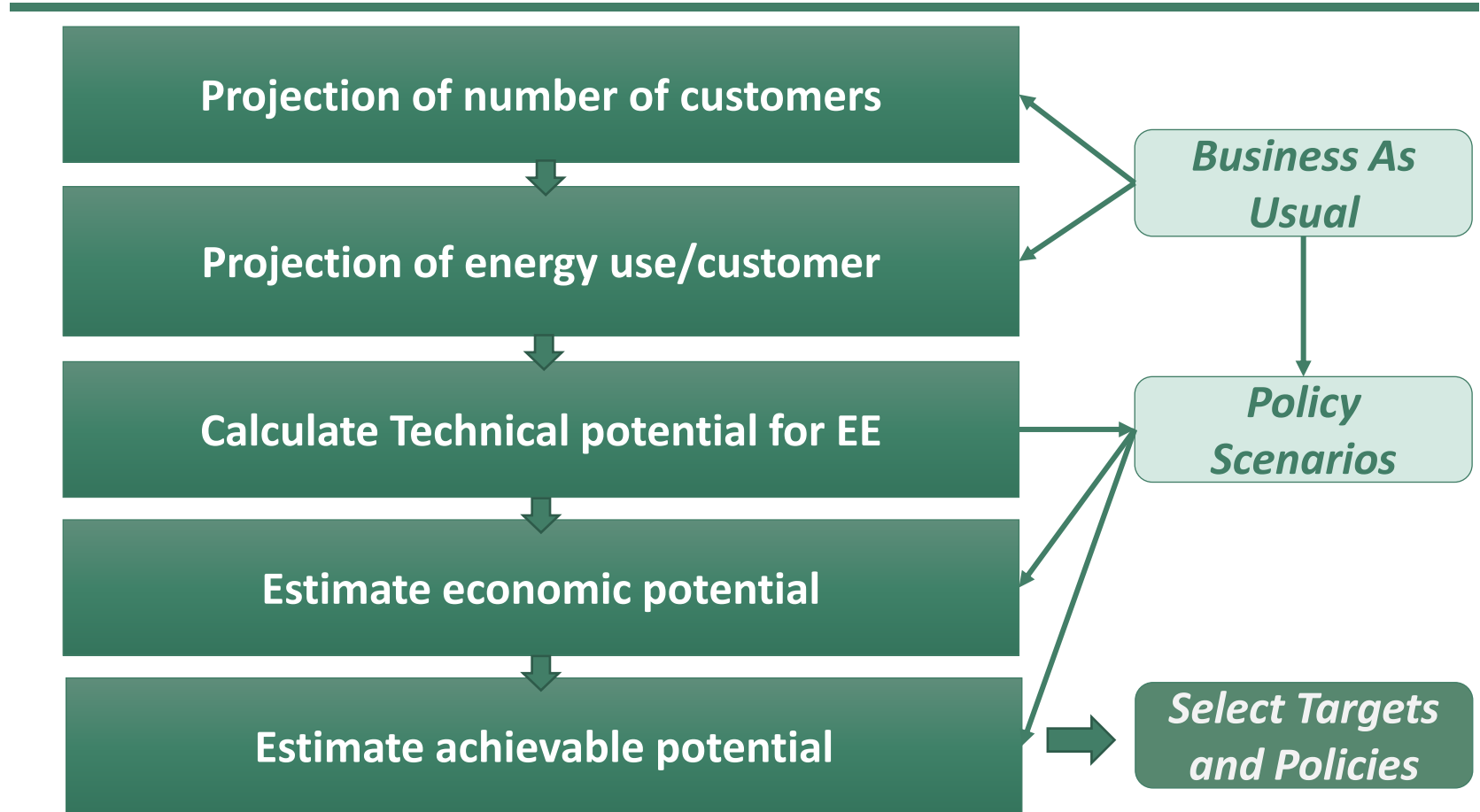
PLUS:

- Reduced escalation in future electricity prices
- Creation of new local jobs in service industries related to energy efficiency
- Increased government revenues from economic activity



Establishing EE Targets

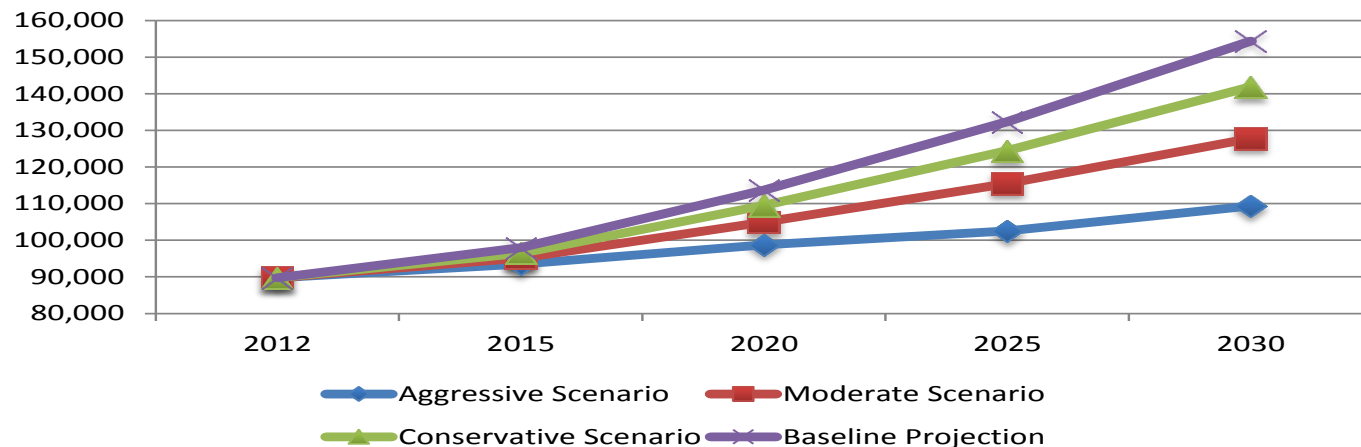
Establishing EE Targets - Methodology



Example of Methodology and Results

Year	2012	2013	2015	2020	2025	2030
Baseline Projection	89,737	92,069	97,968	113,733	132,358	154,394
Technical Potential	-	37,864	45,784	59,413	71,735	84,283
Achievable Consumption						
Aggressive Scenario	89,737	92,069	93,508	98,783	102,562	109,392
Moderate Scenario	89,737	92,069	95,136	104,935	115,510	127,755
Conservative Scenario	89,737	92,069	96,453	109,484	124,442	141,867

Electricity Consumption



Summary of EE Targets Range

Country	Residential Growth Rate	Residential EE Targets Range	Commercial Growth Rate	Commercial EE Target Range
Samoa	3.1%	7% - 39%	3.9%	10% - 27%
Tonga	2.2%	4% - 22%	2.2%	10% - 26%
Vanatu	7.3%	8% - 28%	5.0%	10% - 34%
Cook Islands	2.9%	16% - 31%	2.9%	12% - 29%
PNG	10.6%	6% - 29%	5.0%	10% - 34%



Audit Training

Audit Training

Lectures
Group Exercises
Walk-throughs
Detailed Audits
Measurement & Verification



Samoa

The Cook Islands



Vanuatu



Papua New Guinea



Tonga

Energy Audit Equipment






Guidebooks

Home Energy Guides and Energy Saving Tips

Save Money on Your Electricity Bills

A Guide for Residential Consumers in the Cook Islands



Promoting Energy Efficiency in the Pacific - Phase 2

ADB

03 Cooling

Appliance	Function Type	Cooling Output (kW)	Star Rating (the more stars, the more efficient)	Average Running Costs (per hour)	Estimated Annual Savings
100	Single Deck Split Air	2.0	★★★★★	\$1.04	\$360
100	Split Air	2.0	★★★★	\$1.27	\$290
100	Refrigerator	1.0	★★★★	\$1.50	\$240
100	Refrigerator	1.0	★★★	\$2.02	\$160
100	Refrigerator	1.0	★★	\$2.54	\$110

- #### Energy Saving Tip
- Always check the star rating of your air conditioner before you buy.
 - Use air conditioning only when necessary.
 - Use air conditioning at a lower temperature.
 - Set the thermostat or air conditioner to 25°C. Raising the temperature of your air conditioner by 1°C reduces the energy consumption by 10%.
 - Use air conditioning with the outside temperature below 30°C. Outside the outside air temperature is too high, your air conditioner will have to work harder to cool the air.
 - Use fans to help circulate the air. Fans help to cool you, not the air.
 - Use fans to help circulate the air. Fans help to cool you, not the air.
 - Close the doors of air conditioners regularly.
 - Service the air conditioner of your house.

04 Hot Water

Appliance	Average Running Costs (per hour)
Electric Hot Water Heater (150 litres)	\$4.2
Gas Hot Water Heater (150 litres)	\$2.1

- #### Energy Saving Tip
- Adjust the water heater temperature.
 - Check your water usage regularly.
 - Use low flow shower heads.
 - Close the water tap when you are brushing your teeth.
 - Use a hot water tap aerator.

FA'AITITIA STUPE E ALU I LAU PILI ELETISE

Taiala mo le faaogaina tatau ole eletise i maota ma laoa o samoa



Promoting Energy Efficiency in the Pacific - Phase 2

ADB

05 Cooking

Appliance	Average Running Costs (per hour)
Electric Dishwasher (1 place)	\$1.0
Electric Dishwasher (2 place)	\$1.5
Electric Dishwasher (3 place)	\$2.0
Electric Dishwasher (4 place)	\$2.5
Electric Dishwasher (5 place)	\$3.0

06 Laundry

Appliance	Average Running Costs (per hour)
Washing Machine	\$1.5
Washing Machine	\$2.0
Washing Machine	\$2.5
Washing Machine	\$3.0
Washing Machine	\$3.5

07 Entertainment

Appliance	Average Running Costs (per hour)
Television	\$1.0
Television	\$1.5
Television	\$2.0
Television	\$2.5
Television	\$3.0

Be a Super Saver

good practices

2 Hours per year

10 Hours per year

Represent up to 5% of your electricity cost per year

Did you know that two Ordinary Light Bulbs (incandescent bulbs) left ON for two hours everyday can represent up to 5% of your annual electricity costs? Switch-off your lights when not required!

"Use power wisely and make Big Savings!"

For more details on how to reduce your electricity costs, contact IIEC

Be a Super Saver

energy efficient appliances

Save at least 10% per year on your electricity bills

Did you know that the higher the star rating of the electrical appliance, the lower the running costs? You can save at least 10% per year on your electricity bill costs, when purchasing a 3 star rating (high efficiency) instead of a 1 star rating (low efficiency) appliance!

"Small Change, Big Savings!"

For more details on how to reduce your electricity costs, contact IIEC

01 Fridge/Freezer

Capacity	Star Rating (the more stars, the more efficient)	Average Running Costs (per hour)	Estimated Annual Savings
500L Top	★★★★★	\$1.2	\$400
500L Top	★★★★	\$1.5	\$320
500L Top	★★★	\$1.8	\$240
500L Top	★★	\$2.1	\$160
500L Top	★	\$2.4	\$80

02 Lighting

Lamp Type	Consumption (Watt)	Running Costs (per hour)	Estimated Annual Savings (per hour)
15W Incandescent	15	\$0.08	\$2.70
15W CFL	15	\$0.03	\$2.40
15W LED	15	\$0.01	\$2.10
15W LED	15	\$0.01	\$2.10
15W LED	15	\$0.01	\$2.10

About Star Rating of Electrical Appliances

The more number of stars, the greater the energy savings!

This number of stars tells you how efficient the appliance is. The number tells you how much annual energy the appliance is likely to use in a year.

The star rating indicates the energy efficiency of the appliance as a score of 1 to 6 stars, in the case of IIEC.

Appliance Type and Model Number

How much energy the appliance actually uses annually at standard hours (80% when tested in the laboratory under Standard)

The appliance's New Zealand Standard number which the appliance must meet.

When purchasing new electrical appliances, it is useful to understand the star ratings and the importance of the star rating that you see on the star rating.

For example, in the Cook Islands, a 3 star rating (high efficiency) fridge can saving you at least \$550 per year on your electricity bill when compared to a 1 star rating (low efficiency) of the same size.

Be a Super Saver

renewable energy


Reduce your energy bills by installing solar energy systems for electricity and hot water!

"Saving is easy and helps the environment!"

For more details on how to reduce your electricity costs, contact IIEC




Energy Efficiency Guidelines




ENERGY EFFICIENCY GUIDELINES FOR HOTELS IN THE PACIFIC

Promoting Energy Efficiency in the Pacific (Phase 2)



ENERGY EFFICIENCY GUIDELINES FOR STREET LIGHTING IN THE PACIFIC

Promoting Energy Efficiency in the Pacific (Phase 2)



ENERGY EFFICIENCY GUIDELINES FOR COMMERCIAL & PUBLIC BUILDINGS IN THE PACIFIC

Promoting Energy Efficiency in the Pacific (Phase 2)

Lamp Waste Management

Bulb Eater



Te Aponga Uira

**Guide on
Fluorescent Lamps
and CFLs**

About Mercury

- Mercury is a natural element found throughout the world.
- Human sources represent about 30% of the total amount of mercury emissions each year.
- The main human sources of mercury are small-scale gold mining and coal burning, followed by the production of metals and cement.
- Mercury is widely used in a range of products, including batteries, dental amalgam, paints, switches, electrical and electronic devices, thermometers, fluorescent and energy-saving lamps, pesticides, medicines, and cosmetics.
- Once used, many of these products go to landfills or are incinerated.
- In landfills or following incineration, the mercury contained in these products may come in contact with water, thereby converting the mercury into its toxic form.

About Fluorescent Lamps

- All fluorescent lamps contain small amounts of mercury, which can be released into the environment when the fluorescent lamp breaks, or if they are improperly disposed of at the end of their lifetime.
- An average fluorescent tube lamp typically contains between 7 to 40 milligrams of mercury, while an average Compact Fluorescent Lamps (CFLs) contains about milligrams of mercury.
- By comparison, older mercury thermometers contain about 500 milligrams of mercury – an amount equal to the mercury in over 100 CFLs.
- A good quality CFL uses up to 75% less energy (electricity) than an incandescent light bulb and lasts up to 10 times longer.

Source of Information:
US Environmental Protection Agency (EPA)
United Nations Environment Program (UNEP)



Assessment Framework for Scaling Up EE

Assessment Framework for Scaling Up EE

Review and document current situation in each country related to the factors influencing the implementation of EE
 Develop a “scorecard” and identify key gaps

Enabling EE Legislation

EE Policies & Regulations

Market Characteristics

Financing & Implementation

Capacity & Awareness Building

Energy Efficiency Assessment Framework and Scorecard for the Pacific Islands

Cook Islands

Papua New Guinea

Samoa

Tonga

Vanuatu

Part 1 - ENABLING ENERGY EFFICIENCY LEGISLATION

National Energy Efficiency Law

Energy efficiency provisions are included in national energy legislation

Specific law on energy efficiency enacted

National Energy Efficiency Strategy & Action Plan

National Energy Policy includes EE

Specific energy efficiency policy/strategy developed

Energy efficiency targets established

Energy efficiency action plan developed

Energy efficiency actions initiated according to the plan

National EE Entity (EE Agency or Dept. of Existing Ministry)

Existing agency or department designated as responsible for EE

National energy coordinating/advisory committee established with EE responsibilities

National energy efficiency agency established

EE Building Code - New Buildings

EE building code in preparation

EE building code adopted

Compliance checking in place

Building Certificates/Passports

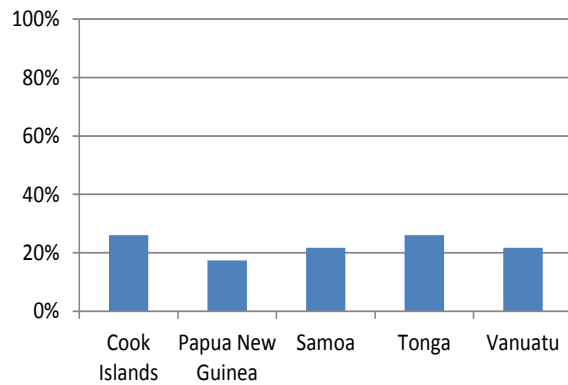
Building certification process developed

Certification system operational

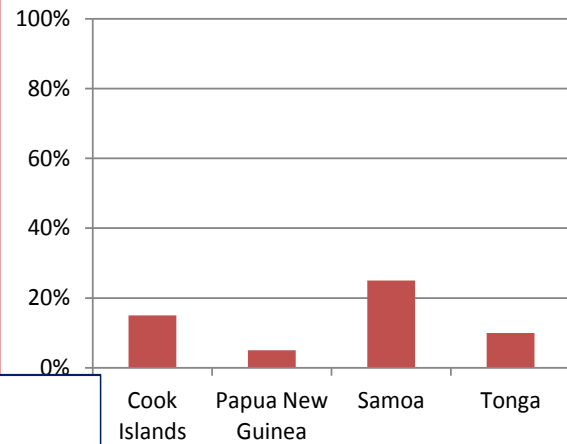
	Cook Islands	Papua New Guinea	Samoa	Tonga	Vanuatu
Energy efficiency provisions are included in national energy legislation					
Specific law on energy efficiency enacted					
National Energy Policy includes EE	✓	✓	✓	✓	✓
Specific energy efficiency policy/strategy developed					
Energy efficiency targets established	✓	✓	✓	✓	
Energy efficiency action plan developed					
Energy efficiency actions initiated according to the plan					
Existing agency or department designated as responsible for EE	✓		✓	✓	✓
National energy coordinating/advisory committee established with EE responsibilities	✓		✓	✓	✓
National energy efficiency agency established					
EE building code in preparation					
EE building code adopted					
Compliance checking in place					
Building certification process developed					
Certification system operational					

The Scoreboard

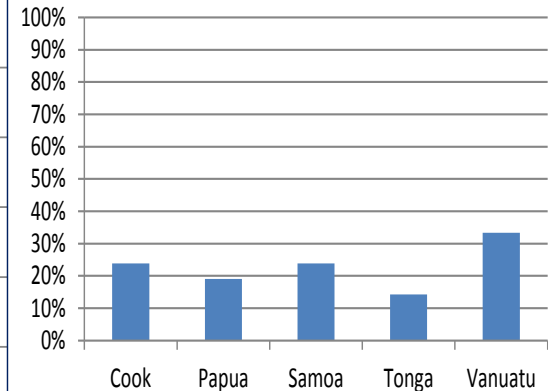
Legislation Score



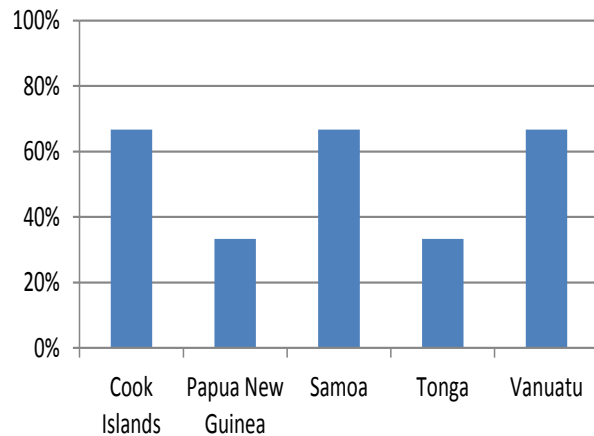
Regulations Score



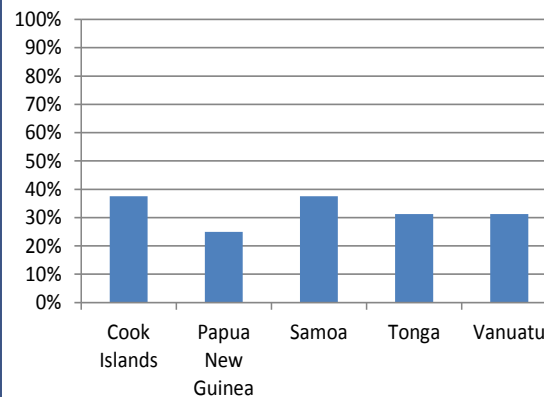
Financial Incentives



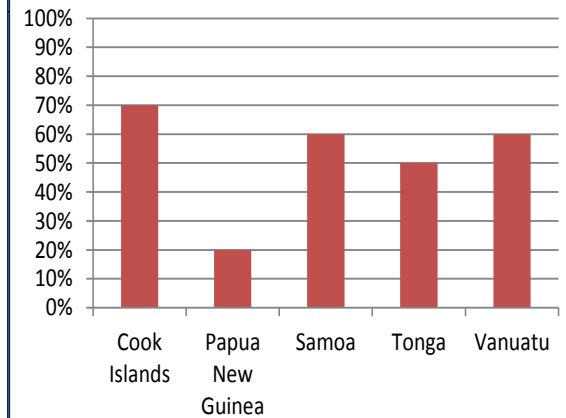
Pricing Score



Capacity Building



Project Implementation



Major Gaps to be Addressed

Legislation	<ul style="list-style-type: none"> • Need for legislative foundation for EE implementation • EE Building codes for new construction • Appliance standards and labelling 	Finance & Implementation	<ul style="list-style-type: none"> • Government sponsored programs to incentivize EE project implementation • Provide audit subsidies • Governments need to “lead by example”
Policies & Regulations	<ul style="list-style-type: none"> • Need for EE revolving fund • Facilitating public sector EE implementation • Regulations to promote utility EE actions • Requirements for energy auditing 	Capacity and Awareness Building	<ul style="list-style-type: none"> • Capacity building of ESPs and ESCOs • Development of M&V agents and protocols
Market Characteristics	<ul style="list-style-type: none"> • Need for maintain and updating data on buildings • Establishing ESP/ESCO markets • Financing markets for EE 	<ul style="list-style-type: none"> • Ongoing formal awareness and information programs • Establishment of energy information center(s) 	



Policy Recommendations

Policy Recommendations

- Establish energy efficiency (EE) as a high priority in National Energy Policy with specific targets
- Develop National EE Strategy and Action Plan
- Require all government agencies to implement cost-effective lighting and A/C measures
- Establish equipment and appliance labelling and standards
- Adopt energy efficient building code
- Implement aggressive campaign of public awareness and information
- Establish Clean Energy Fund to finance EE projects
- Government should “lead by example” by implementing EE in its facilities



Next Steps

Recommended Next Steps

- **Assist in implementing recommendations**
 - Model EE legislation
 - Building codes
 - Appliance standards and labeling
 - Maintaining/updating database
 - Capacity building of energy service providers
- **Apply EE assessment in other PICs and replicate PEEP2 project implementation**
- **Develop financing mechanisms such as EE revolving funds**
- **Develop model DSM regulations and pilot utility action plans**
- **Widely disseminate project results and EE benefits**



Thank You

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