Sustainable Sea Transport Talanoa

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Cost of renewable energy in the Pacific Islands & lessons learnt from deployment of renewables for the power sector

Katerina Syngellakis
SPC-GIZ Sustainable Energy Management Advisor

Coping with Climate Change in the Pacific Island Region (CCCPIR) Programme

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

2012 INTERNATIONAL YEAR OF SUSTAINABLE ENERGY FOR ALL

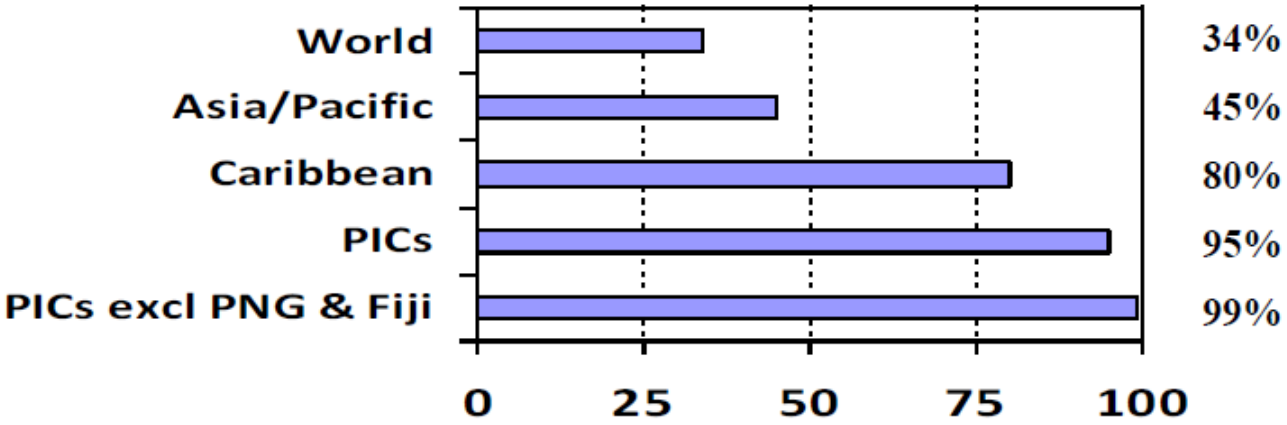
SPC Secretariat of the Pacific Community

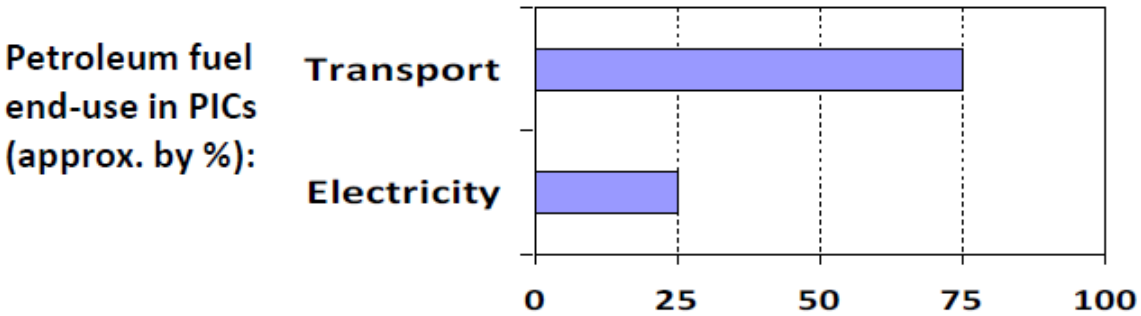
Presentation Plan

- Intro on Renewable Energy (RE) and the Pacific
  - Current energy sources used
  - RE availability & limitations
- Cost data from RE projects in the Pacific
- Lessons learnt from deployment of RE for the power sector

RE and the Pacific Island Countries

Current energy use = extreme dependency on petroleum fuel





Overall transport percentage may be too high and varies between countries e.g. Nauru ~10%, Samoa ~ 80%

Commercial energy only

Sources: Peter Johnston (2010), International Energy Agency (2009), Asian Development Bank (2009), UN (2010)

Any serious effort to substantially reduce fossil fuel imports must address the transport sector

Why and what kind of renewable energy technologies?

- PICs need to gradually diversify their energy portfolio
- Proven, reliable technologies
- Solutions adapted to the Pacific economic, environmental, geographic and cultural context
- Systematic supporting mechanisms to build capacity and provide O&M in the long-term

Which RE? Some issues specific to PICs

- Limited RE resources and measured data
- Limited land availability and access
- Harsh environmental conditions
- Long distance supply chains
- Limited human resources in energy sector vs growing demand for energy services
- Small markets / small private sector = limited capital

Summary of resource potential

Country	Solar	Wind[a]	Biomass	Hydro	Geothermal	OTEC	Wave[a]
Cook Is	✔ ✔ ✔	✔ ✔	✔ ✔			✔ ✔	✔
FSM	✔ ✔	✔	✔ ✔	✔ ✔	✔ ✔	??	??
Fiji	✔ ✔	✔ ✔	✔ ✔ ✔	✔ ✔ ✔	✔ ✔ ✔	✔ ✔	✔ ✔
Kiribati	✔ ✔ ✔	✔	✔			✔ ✔	??
Marshall Is.	✔ ✔ ✔	✔	✔			✔ ✔	??
Nauru	✔ ✔ ✔	✔	✔			✔ ✔	??
Niue	✔ ✔ ✔	✔ ✔	✔			??	??
Palau	✔ ✔ ✔	✔	✔ ✔			??	??
PNG	✔ ✔	✔ ✔	✔ ✔ ✔	✔ ✔ ✔	✔ ✔ ✔	??	??
Samoa	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	??	??
Solomon Is.	✔ ✔	✔ ✔	✔ ✔ ✔	✔ ✔ ✔	✔ ✔ ✔	??	??
Tonga	✔ ✔ ✔	✔ ✔	✔			??	✔ ✔
Tuvalu	✔ ✔	✔	✔ ✔			??	??
Vanuatu	✔ ✔	✔ ✔	✔ ✔ ✔	✔ ✔ ✔	✔ ✔ ✔	??	??

[a] Wind and wave energy are highly site specific
Source: Adapted from Johnston, 1995

Why is information on cost important?

- Economic and finance information is a decision-making tool for Governments, utilities and private sector investors in RE
- The cost of renewables have declined rapidly in recent years = opportunity…*but information on real, on-site costs of RE technologies in the Pacific is very limited*

Cost information available in the Pacific to date

- Data is not systematically collected and/or is difficult to access
- Cost figures date back a few years
- Decision making is often based on outdated numbers or on international data which does not take into account particularities of Pacific

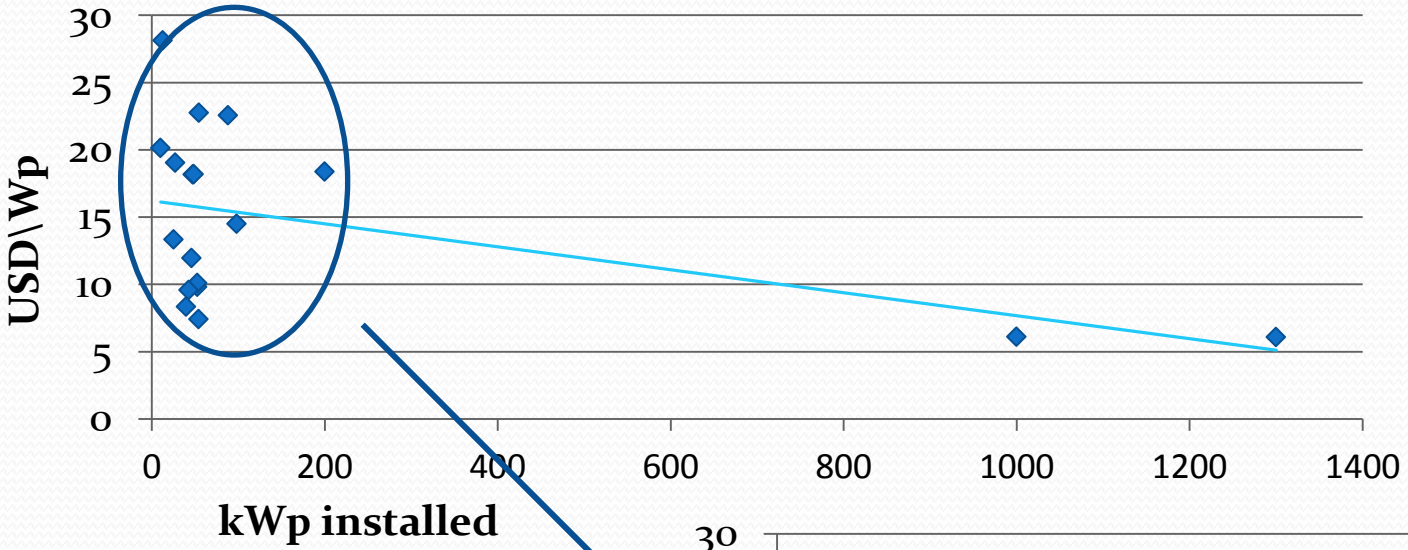
Costs from RE projects in the Pacific

With a focus on solar & wind

Solar PV costs

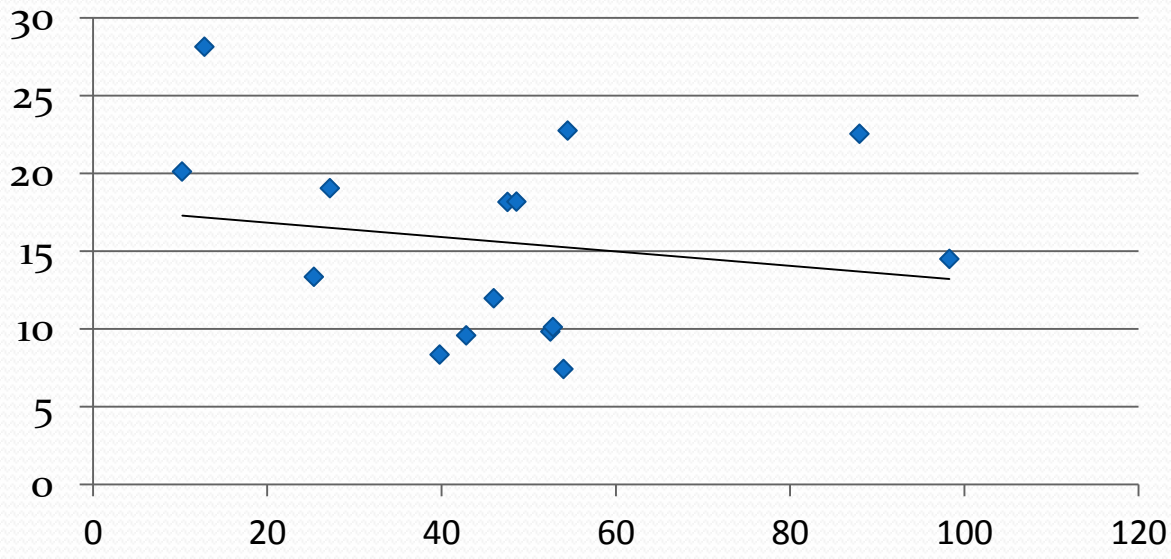
- Most common installation in the PICs
- All PICs have some experience with solar PV – most info available *but not as much as there should be*
- Four main types:
  - Solar home systems / lighting systems
  - Small off-grid systems (schools, health centres)
  - Grid-connected PV
  - Hybrids

Installed cost of solar PV



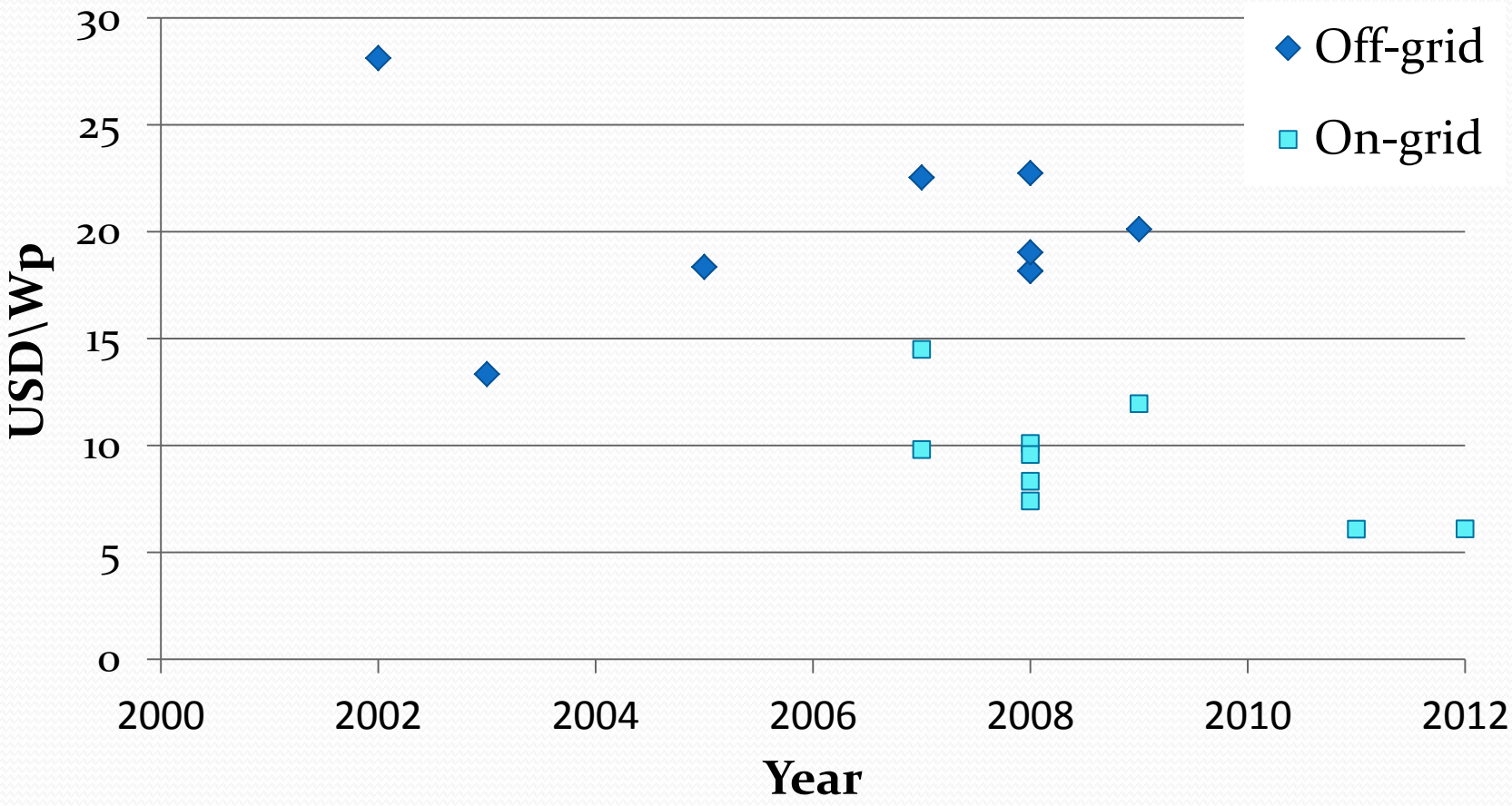
Most systems are still <100kWp

Large variation ~ a lot of different factors influencing cost



Data from 2000 onwards only, various sources

Solar PV costs over time



Installed cost of Wind

Country	Project Size	USD/kW	Year
Samoa	2 MW	3000	2010
Niue	275 kW	2072*	2007
Fiji**	10MW	1966	2006
Cook Islands	2 MW	3957	2006
Cook Islands	3.75 MW	4263	2002
Cook Islands	1.8 MW	3716	2002
Cook Islands**	40kW	4100	2003
New Caledonia**	4.5 MW	3874	2002
Tuvalu	200 kW	3485 - 4481	2010
Vanuatu**	3025 kW	2321	2012

*price per turbine ex works: installation and transport not included
**completed project (actual project cost is stated)

Sources: various reports

Installed costs – other RE

- There are not much cost data available on other technologies
- Hydro not relevant for transport sector
- Biomass (wood) - pre-feasibility in Samoa indicated costs between 3000-6000 USD/kW installed
- Biofuel – limited number of projects, therefore limited data. Only Fiji really has experience in biodiesel and coconut oil for power (and transport).
- Biofuel - questions over land and environmental impacts

Summary of installed costs

Technology	Pacific USD / kW	Worldwide USD/kW (REN21, 2011 & 2012)
Grid-connected solar PV	4500 – 14000	2500 - 3500
Off-grid solar PV	10000 – 34000	10000 – 20000
Micro-hydro	4000 – 23000	Highly variable but usually 2000 - 4000
Small-scale wind	2000 - 5000	2000 – 6000
Large-scale wind	2000 - 4000	1500 – 2500
Small-scale biomass	3500 - 6000	3000 - 4600
Diesel	800 - 1500	

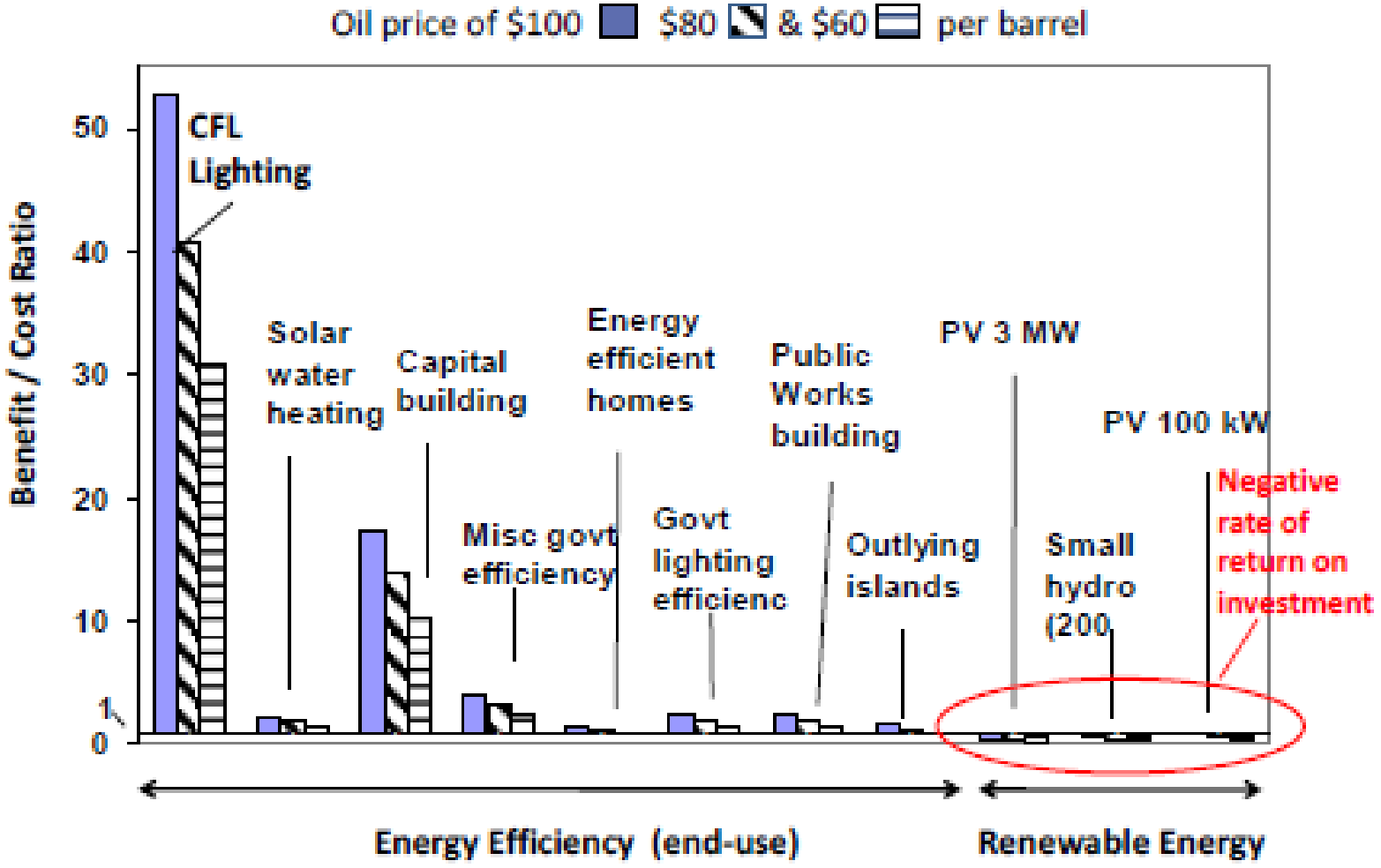
Summary of generation costs

Technology	PICs range of cost in USD / kWh	International costs (REN21) USD / kWh
Grid-connected solar PV	0.35 – 0.70	0.22 – 0.44
Large-scale PV + battery storage	0.75	0.25 – 1.00
Off-grid solar PV	1.50 – 2.50	0.40 – 0.60
Wind	0.14 – 0.30	0.05 – 0.20
Coconut oil	0.34 – 0.38	0.30 – 0.80 (biofuel/biodiesel)
Biomass gasification	0.16 – 0.22	0.08 – 0.12
Urban diesel	0.15 – 0.49	-
Rural diesel	1.00 – 2.50	-

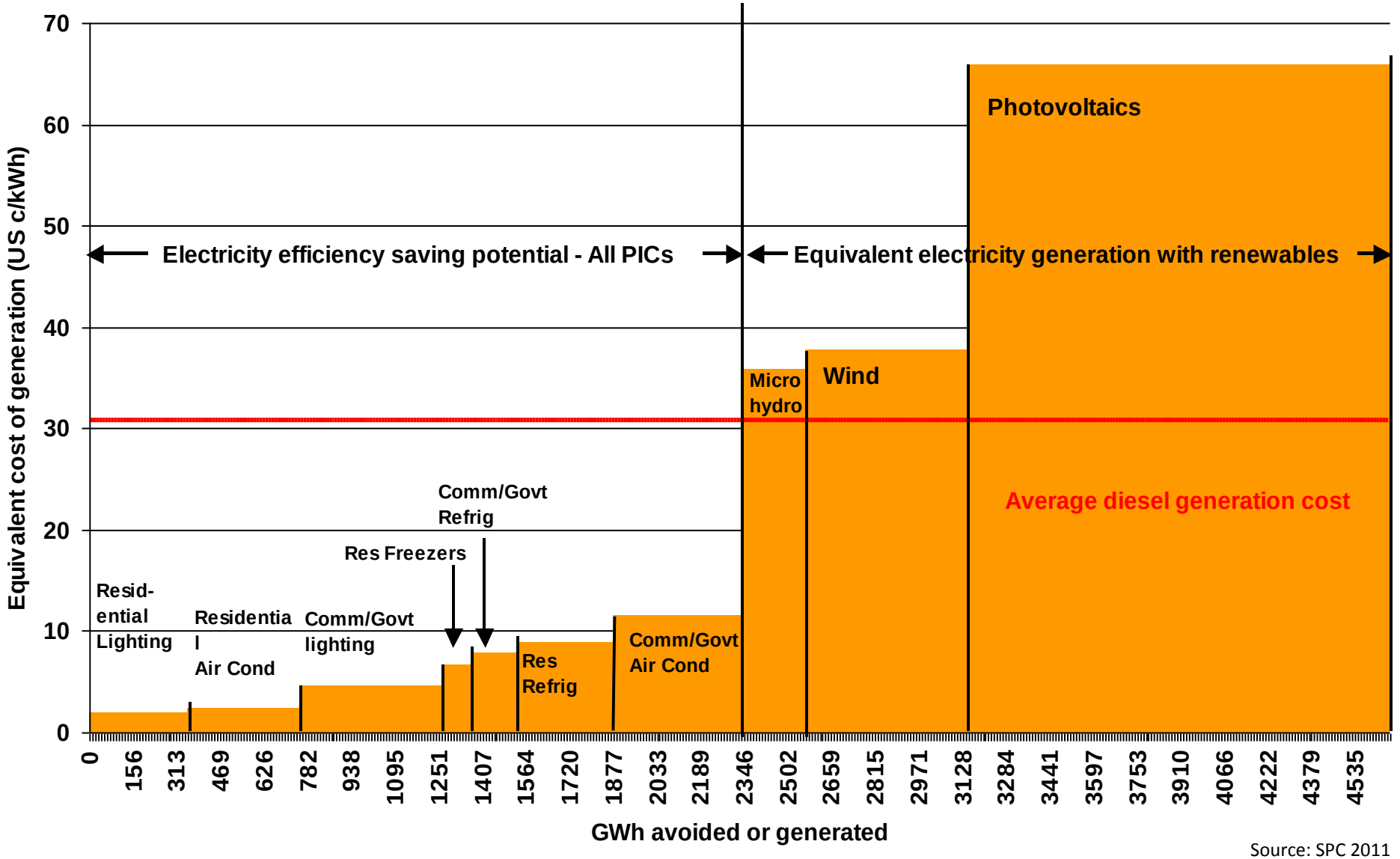
PIC data from various sources

What about energy efficiency?

Figure 2: Relative Benefits and Costs for Energy Investments in Palau (2008)



Source: Johnston, 2010



Source: SPC 2011

By 2025, these energy efficiency programs could be 'supplying' one eighth of the electricity used in the PICs, pollution free. This would also mean a 12% reduction in generation fuel import costs.

A few more comments on costs

because there's not enough time to cover everything

O&M costs

- Seriously underestimated for most RE projects
- Biggest area needing improvement in knowledge and data availability

Transport & Logistics

- RE faces same supply chain issues as other technologies

The less talked about costs...

- Confirming the resource – assessment / feasibility costs
- Taxes & duties on RE equipment
- Land issues
- Environmental costs

Lessons learnt from the power sector

Economic / Financial viability

- Generalisations across PICs for the same technology should be avoided as financial viability can vary significantly depending on location – even within the same country
  - Transport and logistics
  - Labour costs
  - Technical capacity & know-how
  - Competing uses of the energy resource
  - Environmental Impact
  - Population income and willingness to pay for services

Institutional frameworks

- Lack of regulations to create an enabling environment:
  - Framework for private sector investment
  - Non-transparent subsidies / unsustainable subsidies, particularly for outer island electrification
  - Regulating bodies?

Technical capacity

- RE technologies still relatively new
- Staff need to trained and retained
- **Recommendations:**
  - Focus first on the most viable technologies and seek independent advice
  - Insist on donor support for post-installation training
  - Establish training in technical colleges and universities to nurture the energy professionals of the future

Cross-sectoral coordination

- As energy affects all sectors of the economy efforts have to be increased to coordinate planning and projects
  - Ministries of Transport, Environment, Agriculture, etc
  - Education providers
  - Multi-lateral, bi-lateral donors, CROP agencies, NGOs and technical cooperation
  - Private sector

*Although diversification of energy supplies is a priority for PICs time should be taken to plan strategically so that the conditions are in place for new renewable energy (**power and transport**) infrastructure to be functioning as desired for many years to come*

Thank you!

Any questions?

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