Ocean Energy Projects and Prospects in Pacific Island Countries
Outline

- The Pacific in context
- Prospects
- Projects
- RE – a development issue
- Challenges
- Possible way forward
Population
PNG – 7 Million
Niue – 1500

Population Density
PNG – 8 persons/km²
Tuvalu – 363 persons/km²

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

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)
Ocean Energy Prospects
Ocean Energy Prospects

Size Comparison
1MW wind turbine compared with a 1MW tidal turbine

55m dia.

18m dia.
### Ocean Thermal Energy Conversion (OTEC)

**Potential in the Pacific**

<table>
<thead>
<tr>
<th>Country</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Temp. difference (°C) between 0 – 1000 m depth</th>
<th>Distance to Shore (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Samoa</td>
<td>12 S</td>
<td>165 W</td>
<td>22 – 23</td>
<td>75</td>
</tr>
<tr>
<td>Australia</td>
<td>10 – 40 S</td>
<td>115 – 155 E</td>
<td>18 – 22</td>
<td>100</td>
</tr>
<tr>
<td>Cook Islands</td>
<td>18 – 22 S</td>
<td>155 – 165 E</td>
<td>21 – 22</td>
<td>1 – 10</td>
</tr>
<tr>
<td>Fiji Islands</td>
<td>15 – 20 S</td>
<td>175 – 180 E</td>
<td>22 – 23</td>
<td>1 – 10</td>
</tr>
<tr>
<td>Guam</td>
<td>13 N</td>
<td>145 E</td>
<td>24</td>
<td>1</td>
</tr>
<tr>
<td>New Caledonia</td>
<td>20 – 22 S</td>
<td>165 – 168 E</td>
<td>20 – 21</td>
<td>1 – 10</td>
</tr>
<tr>
<td>Papua New Guinea</td>
<td>0 – 11 S</td>
<td>131 – 151 E</td>
<td>22 – 24</td>
<td>30</td>
</tr>
<tr>
<td>Samoa</td>
<td>10 – 16 S</td>
<td>168 – 175 W</td>
<td>22 – 23</td>
<td>1 – 10</td>
</tr>
<tr>
<td>Solomon Islands</td>
<td>4 – 12 S</td>
<td>155 – 165 E</td>
<td>23 – 24</td>
<td>1 – 10</td>
</tr>
</tbody>
</table>

Source: National Renewable Energy Laboratory, USA
## Potential in Palau

<table>
<thead>
<tr>
<th>Potential</th>
<th>Size of OTEC plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melkeok</td>
<td>3MW x2+4MW x1=10MW</td>
</tr>
<tr>
<td>Airai</td>
<td>3MW x2+4MW x1=10MW</td>
</tr>
<tr>
<td>Ngarchelongs</td>
<td>2MW x 1 = 2MW</td>
</tr>
<tr>
<td>Ngaraard</td>
<td>2MW x 1 = 2MW</td>
</tr>
<tr>
<td>Ngiwal</td>
<td>2MW x 1 = 2MW</td>
</tr>
<tr>
<td>Peleliu</td>
<td>2MW x 1 = 2MW</td>
</tr>
<tr>
<td>Angaur</td>
<td>2MW x 1 = 2MW</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30MW</strong></td>
</tr>
</tbody>
</table>

The first priority to be offered is a 3MW of Melkeok St.

**Ngaraard St. 3MW OTEC**
- Potable Water Production
- Aquaculture
- DOW Ice Production

**Ngarchelongs St. 3MW OTEC**
- Potable Water Production
- Aquaculture
- DOW Ice Production

**Ngiwal St. 3MW OTEC**
- Potable Water Production
- Aquaculture
- DOW Ice Production

**Peleliu St. 2MW OTEC**
- Potable Water Generation
- Aquaculture
- Local Area Chilling Service
- DOW Ice Production

**Melkeok St. 10MW OTEC**
- Potable Water Production
- New Capital Area Chilling Service (for office, hotel)
- DOW Ice Production
- Hydrogen Production

**Airai St. 10MW OTEC**
- Potable Water Generation
- Local Area Chilling Service
- Hydrogen Production
## Wave Energy

### Potential in the Pacific

<table>
<thead>
<tr>
<th>Country</th>
<th>Electricity Generation Potential (kW/m)</th>
<th>The U.S. Wave Energy analysis in 2003 using WEM Average WEM Power Output (kW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cook Islands</td>
<td>23 – 30</td>
<td>324</td>
</tr>
<tr>
<td>Fiji Islands</td>
<td>23 – 29</td>
<td>296</td>
</tr>
<tr>
<td>Kiribati</td>
<td>10 – 15</td>
<td>-</td>
</tr>
<tr>
<td>Samoa</td>
<td>16 – 25</td>
<td>253</td>
</tr>
<tr>
<td>Tonga</td>
<td>17 – 29</td>
<td>279</td>
</tr>
<tr>
<td>Tuvalu</td>
<td>15 – 20</td>
<td>-</td>
</tr>
<tr>
<td>Vanuatu</td>
<td>10 – 20</td>
<td>-</td>
</tr>
</tbody>
</table>

Sources: Ocean Wave Energy in the South Pacific – the resource and its utilisation; Country Reports by the US. Wave Energy
Wave Energy - A Global Resource
Projects in the Pacific
Site-specific survey in Kadavu, Fiji Islands to identify a suitable site closer to land for a 50kW pilot demonstration project.

3D Digital Terrain Model of the seafloor fronting Muani Village viewed from the East.
Measurements
Renewable Energy – a Development Issue
Current Pacific Renewable Energy Initiatives

- PIGGAREP
- IUCN
- PPA
- PMESCOs (micro-financing)
- Resource Assessments (wind, biofuels, wave)
- Policies /legislations
- Information Sharing
- Biofuels (coconut oil)
- Capacity Development
Do we have the appropriate Frameworks?

National Development Strategies

Pacific Islands Energy Policy
November 2004

Kiribati National Energy Policy
Government of the Republic of Kiribati
April 2009

Tuvalu National Energy Policy
Government of Tuvalu

“Reliable, affordable and sustainable energy, enabling the socio-economic development of Nauru”

Energy Policy Framework
Challenges

- Expensive
- Environmental Impacts
- Commercialised?
- Social & Cultural Policies & Institutional Resources
- Prone to natural disasters
<table>
<thead>
<tr>
<th>Number of Cyclones for Each Geographical Area for a Period of 25 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 3 2 3 3 2 2 5 3 5 3 5</td>
</tr>
<tr>
<td>5 5 7 5 5 5 5 6 9</td>
</tr>
<tr>
<td>2 11 12 9 12</td>
</tr>
<tr>
<td>8 13 11 10 5 3 1 1</td>
</tr>
<tr>
<td>3 8 4 6 6 2 4 3 2</td>
</tr>
<tr>
<td>1 1 1 1 1 1 1 2 2</td>
</tr>
</tbody>
</table>
Summary

- Pacific – unique circumstances
- Prospects
- Projects – trials
- RE – a development issue
- Challenges – various
Where to from Here?

Nationally

Regionally

Nationally

Global
Thank You