

SYMPOSIUM ON RENEWABLE ENERGY TECHNOLOGIES

October 7-8, 2010

Raiwai Campus, FNU



The Relevance of Renewables to the Pacific Region

Associate Professor Anirudh Singh

Head of Renewable Energy Programme

USP, Laucala Bay, Suva

Email: singh_ag@usp.ac.fj



Content of talk

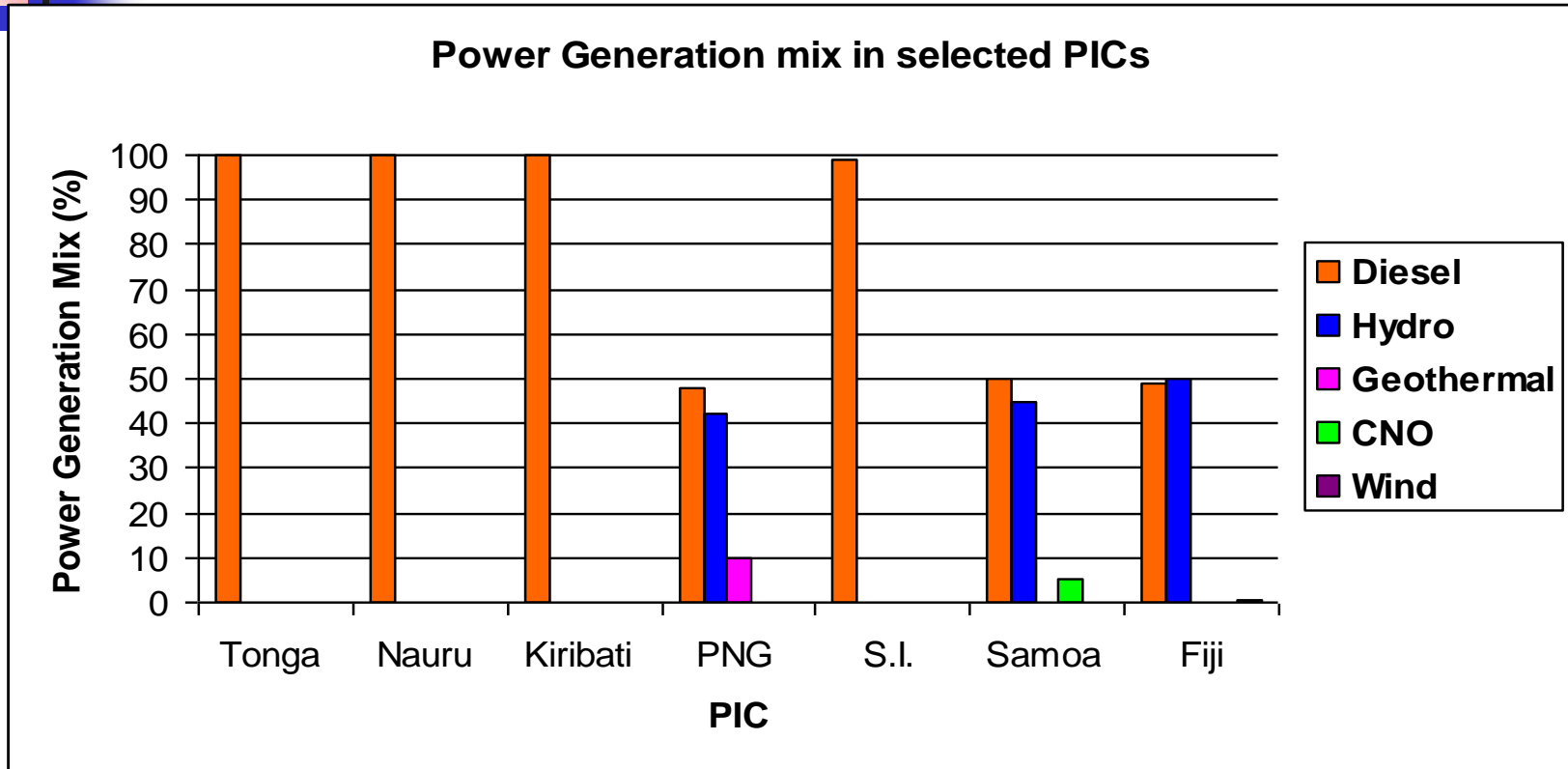
- 1. Energy Challenges faced by PICs**
- 2. Can Renewable Energy help?**
- 3. Renewable energy resource availability in the PICs**
- 4. Problems with Renewable Energy**
- 5. Requirements for the development of a viable RE sector**
- 6. Towards a viable energy solution for the Pacific**
- 7. Are there lessons for Fiji?**
- 8. Conclusion**



1. Energy challenges in the PICs

- Lack of indigenous fossil fuel sources
- Heavy dependence on fossil fuel for power generation
- Remoteness means high import costs and energy supply chain issues
- Lack of institutional mechanisms (including trade infrastructure) and policy frameworks for RE development
- Lack of human capacity

Fraction of imported fossil fuel for power generation in selected PICs



Source: JICA report (2009); TERM (2010); FEA annual report (2008)

2. Can Renewable Energy Help?

- Is the traditional belief that RE can replace fossil fuel true?
- How Fiji's imported fossil fuel is used

Table 1: Fuel consumption in Fiji in 2007

Fuel type	Quantity (000 litres)	Percent of total (%)	Value F\$(000)
Motor spirit	78,753	9.55	95,429
Auto Distillate	62,231	7.55	62,208
Aviation fuel	291,327	35.33	321,743
Industrial distillate	375,656	45.55	416,912
Residual fuel	16,017	1.94	12,950
kerosene	667	0.08	1,062
Total	808,650	100	910,304



What do we need energy for?

Stationary energy

- **Power** – diesel, hydro, wind, solar, geothermal, biomass and biofuels (including gasification)
- **Domestic energy needs**, cooking (firewood, gas, kerosene), appliances (electricity), heating (solar, electricity), cooling (electricity)
- **Industrial energy needs** – e.g. process heat (bagasse, fuelwood, timber milling residues), electricity

Transportation

- Several forms of fossil fuels (petrol, diesel, LPG, some biofuel blends (E10 etc))
- i.e. almost totally dependent on imported fossil fuels
- biofuels can replace fossil fuels, but we cannot produce enough biofuels



Fossil fuel and transportation

Transportation will depend mainly on fossil fuel for a long time to come, because we cannot produce enough biofuels globally or locally to totally replace fossil fuel for transportation.

Thus, it is unlikely that fossil fuel will be totally replaced by renewable energy in the PICs.

The PICs (and the rest of the world) will remain dependent on fossil fuels for the foreseeable future.



3. RE resource availability in the PICs

Fiji – current status

- Hydro- monasavu (80MW), Wainikasou (6 MW), Nadago (2.8MW), Nadarivatu(40MW)
- Solar – yes
- Wind – Butoni (10MW)
- Biomass – Bagasse (FEA), Hog fuel (Tropic woods)
- Biofuel – coconut oil (FdoE projects, standards)
pongamia
- Geothermal – possibilities
- Ocean - ?

Renewable energy resources of selected PICs

Country	Geog	Solar (kWh/ m ² /day)	Wind	Hydro	Biomass/fuel	Geothermal	Ocean
Nauru	21 km ²	Yes (5.8)	?	No	No	No	No
Kiribati	32 atolls	Yes (5.7)	No – atolls	No	CNO (5500Mt on	No	No
PNG	mountainous	Yes (6)	Yes – 19 sites	Yes (1400MW)	Timber, palm oil	Yes (1 station)	No
S.I.	6 volc.Is	Yes	No data	Yes (JICA 330MW)	CNO	Maybe	No
Samoa	2 volc is	Yes (6)	~ 3m/s	Yes (issues)	5% CNO blend	No	No
Fiji	2 volc	Yes	Yes - Butoni	yes	Timber, CNO	?	?



Hydro potential for Fiji

- FDoE- 8 projects installed (977 kW) at Wainiqueu (600 kW), Bukuya(100kW), Muana (30kW), Marist tutu(20kW), Nasoqo(4 kW), Vatukarasa(3 kW), Kadavukoro(20kW) – but only 3 operational
- 1983 World Bank/UNDP study estimated a total of 300MW promising (>2 MW) hydro resources (including Monasavu and Nadarivatu)
- ***But recent reports indicate at least 23 MW additional potential in Namosi alone***
- ***A thorough and independent resource assessment required.***

4. Problems with Renewable Energy

– data and viability of technology

Table 3: Technical Assessment of RE Technologies for power generation

RET	Technology efficiency	Capacity Factor	Lifetime	Cost/kW	Payback period	Commercial availability
Wind	~40%	10-25%	> 25 yrs maintenance reqd	~\$10,000	<25 yrs	Yes
PV	12-15%	~50%	25-30 yrs	~\$25,000	25-35 yrs	Yes
Micro-Hydro	90%	~100 %	>25 yrs low maintenance	\$2000-5000	5-10 yrs	Yes
Biomass	< 60%	Biomass availability	~25 yrs	-	< 25 yrs	Yes
Biofuel	< 60%	Biofuel availability	~25 yrs	-	< 25 yrs	Yes/No



Problems with RE (cont.)

Hydro is the most viable renewable energy resource.

We must optimise our use of this resource.



5. Requirements for the development of viable RE sector

- Policy framework (policy/legislation, strategy, action plan)
- Resource availability
- Access to mature and commercially available (off the shelf) technology
- Institutional mechanisms for resource development and utilization
- Human capacity (sci and tech, admin, business know-how)
- Economic infrastructure
 - roads, information communication and energy database
- Stable economy based on capable and stable population (migration and brain drain)
- Political stability

Case studies of PICs

	Samoa	Cook Is	Tuvalu	Vanuatu
Energy policy	yes	yes	100% RE powergen by 2020	Rural electrification. policy being drafted
Grid-connected power	36 MW grids on Upolu and Savaii	11 indiv grids, totaling 5MW on Rarotonga.	1500kW installed capacity, also 8% from PV	11 MW diesel and 2.75 MW wind farm on Efate.
Energy mix and RE potential/plans	Diesel, hydro, 2MW, gasification plant planned	Diesel, small PV grids, wind monitoring on Raro and Aitutaki.	Diesel, PV, wind	Diesel, Solar LED project, 1.2 MW hydro in Sarakatta, geothermal potential on Efate
Capacity building needs	Technicians, with biomass gasification know-how.	Academic training (eng.) on RE generation, resource assessments	Trained RE staff; ability to compile and analyse energy data; conduct energy audits	No capacity to coordinate RE projects, lack of awareness of RE; feasibility studies.



Country Case studies (cont)

- The recurring story of migration – the case of Tokelau (90% of Tokelauans live abroad).
- The Diaspora model for analysis of population migration (diaspora = people at home + those abroad).
- Migration causes diaspora.
- Bright side to diaspora - remittances and returning residents who invest in home country (“diaspora ain’t all bad”)
- Need to nurture a sense of belonging to home base.



6. Towards a viable energy solution for the Pacific

- Recent awakening amongst energy specialists
 - RE alone not enough to solve energy challenge
- must be coupled with ***efficient use of fossil fuels (vis a vis RE), energy efficiency and conservation***
- Our energy problems can only be solved through a “whole-of-sector approach”.
- The Tonga Energy Roadmap (TERM) is an excellent prototype for this new methodology.



The Tonga Energy Road Map (TERM) 2010-2020

- “A ten year road map to reduce Tonga’s vulnerability to oil price shocks and to achieve an increase in quality access to modern energy services in an environmentally sustainable manner”
- To reduce Tonga’s fossil fuel dependence for power generation by 50% asap



TERM (cont1)

Four methods to achieve this aim:

- improve petroleum supply chain
- increase efficiency and reduce losses at the Tonga Power Ltd (TPL) Power Station (supply side intervention)
- increase efficiency of conversion of electricity to consumer services (i.e. demand side intervention)
- increase the fraction of renewable energy in the energy mix



TERM – a whole of sector approach

- TERM will use **a whole-of-the-sector** approach
- comprehensive, all-inclusive method
 - involves all line ministries associated with energy at once
 - pragmatic approach to use of RE – only mature technology will be considered



TERM – whole of sector(cont.)

- a malleable approach – if the problem changes over time, the plan will be revised accordingly
- nothing left to the imagination (she won't be right) – learn from proof-of-concept projects first before deciding the final renewable energy solutions to be used
- a ***new paradigm in problem-solving***



The role of regional energy policies

- We need energy policies at both the regional and national levels to solve our energy problems
- The demise of the Pacific Islands Energy Policy (PIEP)
- The birth of the Framework for Action for an Energy Secure Pacific (FAESP)
 - starts by accepting the reality of fossil fuels as an essential energy source for the PICs
 - Based on the whole-of-sector approach
 - But respects the National Energy Policies
 - Acknowledges TERM as a prototype
 - Implementation plan currently being drafted.

7. Are there lessons for Fiji?



- What can Fiji learn from the new thinking?
- Fiji's current electricity crisis could be alleviated through
 - Greater DSM and SSM of energy use by power utilities and users
 - A thorough survey of Fiji's hydro potential
 - A study of Fiji's internal and external migration
- Treat Fijians abroad as part of the Fijian Diaspora – inculcate a greater sense of belonging to Fiji.

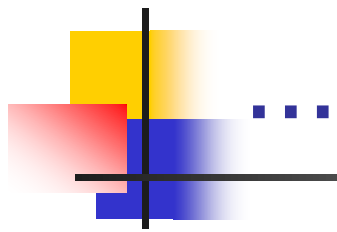


8. Conclusions

The traditional belief that renewable energy (RE) can solve all our energy problems is no longer true.

We must embrace the new thinking in RE:

- We must consider the whole-of-sector approach to the solution of our energy problems.*
- We must also think of Energy Efficiency and conservation to achieve our energy objectives.*



Thank you
for your attention!