

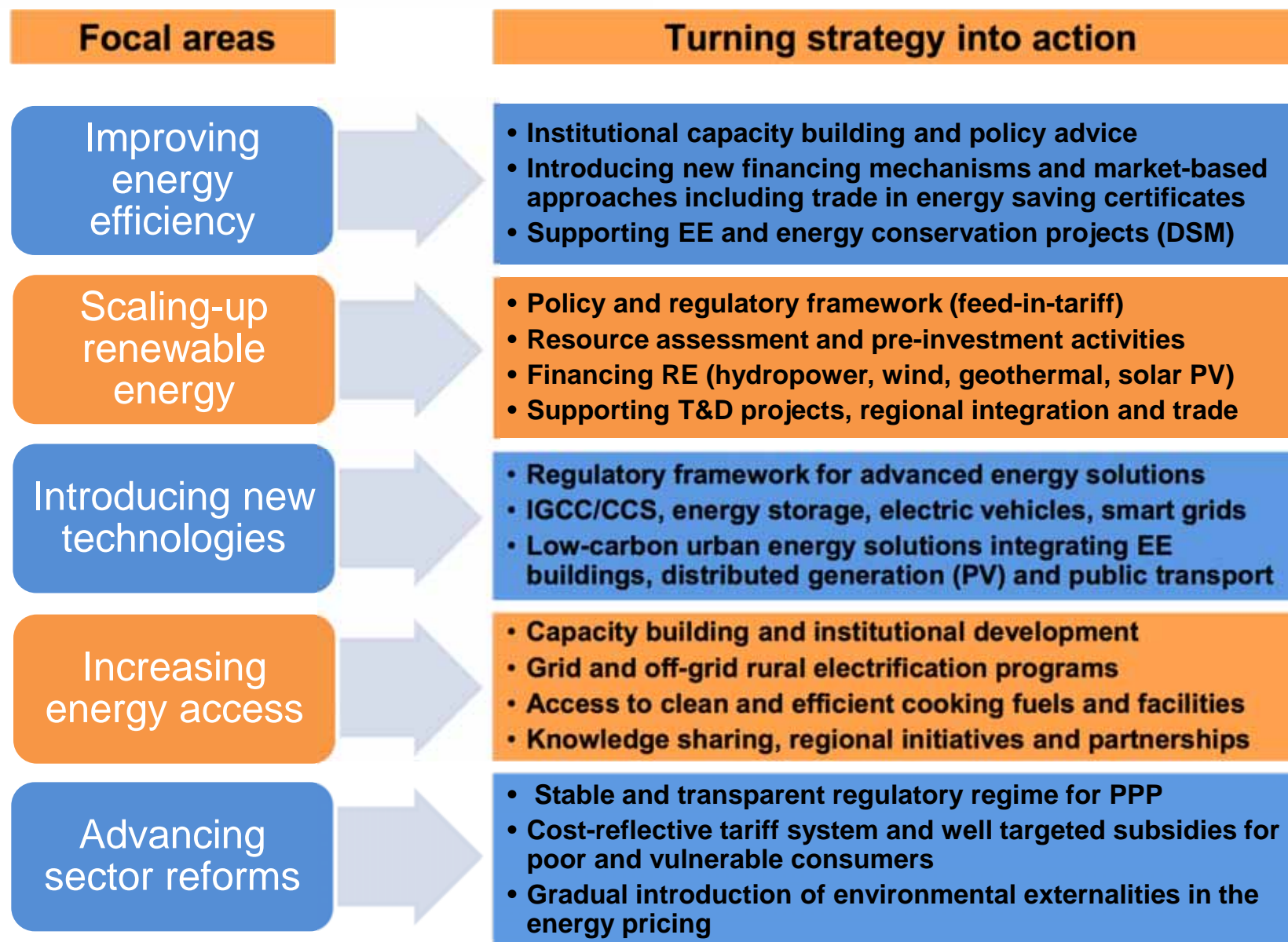


# Scalability and Feasibility of Renewable Energy Microgrids in Pacific Islands

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Honolulu, Hawai'i, September 9, 2013

# World Bank: East Asia and Pacific Energy priorities



# World Bank: East Asia and Pacific Energy priorities

## Focal areas

Improving energy efficiency

Scaling-up renewable energy

Introducing new technologies

Increasing energy access

Advancing sector reforms

## Turning strategy into action

- Institutional capacity building and policy advice
- Introducing new financing mechanisms and market-based approaches including trade in energy saving certificates
- Supporting EE and energy conservation projects (DSM)

- Policy and regulatory framework (feed-in-tariff)
- Resource assessment and pre-investment activities
- Financing RE (hydropower, wind, geothermal, solar PV)
- Supporting T&D projects, regional integration and trade

- Regulatory framework for advanced energy solutions
- IGCC/CCS, energy storage, electric vehicles, smart grids
- Low-carbon urban energy solutions integrating EE buildings, distributed generation (PV) and public transport

- Capacity building and institutional development
- Grid and off-grid rural electrification programs
- Access to clean and efficient cooking fuels and facilities
- Knowledge sharing, regional initiatives and partnerships

- Stable and transparent regulatory regime for PPP
- Cost-reflective tariff system and well targeted subsidies for poor and vulnerable consumers
- Gradual introduction of environmental externalities in the energy pricing



*Electricity for a Better  
Life*

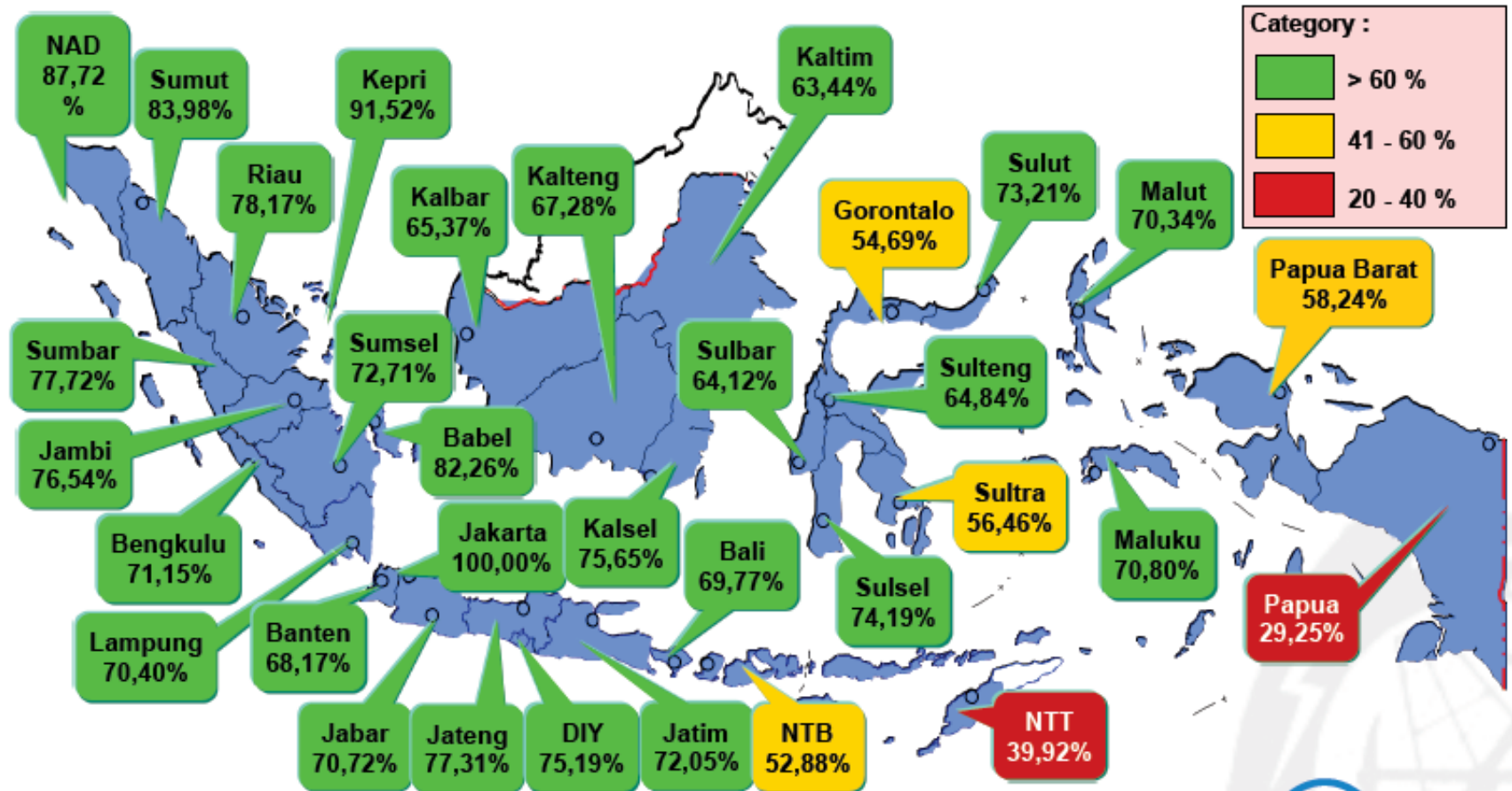
## **Indonesia: 1000 Islands Electrification Program**

# **Renewable Energy based Electricity Access Scale-up & Integration**





# Indonesia Electrification Rate – Target 90 % by 2019



	REALIZATION (Year)						PLAN (Year)			
	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Electrification Ratio	63%	64,3%	65,1%	65,8%	67,2%	72,95%	75,9%	78,0%	80,0%	

# Meeting the Indonesia Electrification Challenge

In response:

- The Government has announced a **1,000 islands electrification program** as a means to improve electricity access in its outer islands through renewable energy sources
- As part of the strategy to address the high cost of generation:
  - PLN is **converting**, where technically and economically feasible and sustainable, its isolated grids **from pure diesel-based generation to renewable diesel hybrid systems**
  - investing in **new solar-diesel hybrid** systems, and
  - investing in **mini-hydros**
- In parallel, PLN is embarking upon a grid rollout program that would improve electricity access, especially in the outlying communities in remote islands

# Integrated Renewable Energy Planning and Investment Program

**RENEWABLE ENERGY  
RESOURCE MAPPING**

MESO SCALE MAPPING

GROUND BASED  
MEASUREMENTS

# Integrated Renewable Energy Planning and Investment Program

## RENEWABLE ENERGY RESOURCE MAPPING

MESO SCALE MAPPING

GROUND BASED  
MEASUREMENTS



## GEOSPATIAL MAPPING - LEAST COST ELECTRIFICATION PLANNING

[GIS BASED RAPID  
SPATIAL PLANNING  
PLATFORM]

ISLAND-BASED ISOLATED  
GRIDS, GRID EXTENSION,  
& OFF GRID  
COMPLEMENT PLANNING



# Integrated Renewable Energy Planning and Investment Program

## RENEWABLE ENERGY RESOURCE MAPPING

MESO SCALE MAPPING

GROUND BASED MEASUREMENTS

## GEOSPATIAL MAPPING - LEAST COST ELECTRIFICATION PLANNING

[GIS BASED RAPID SPATIAL PLANNING PLATFORM]

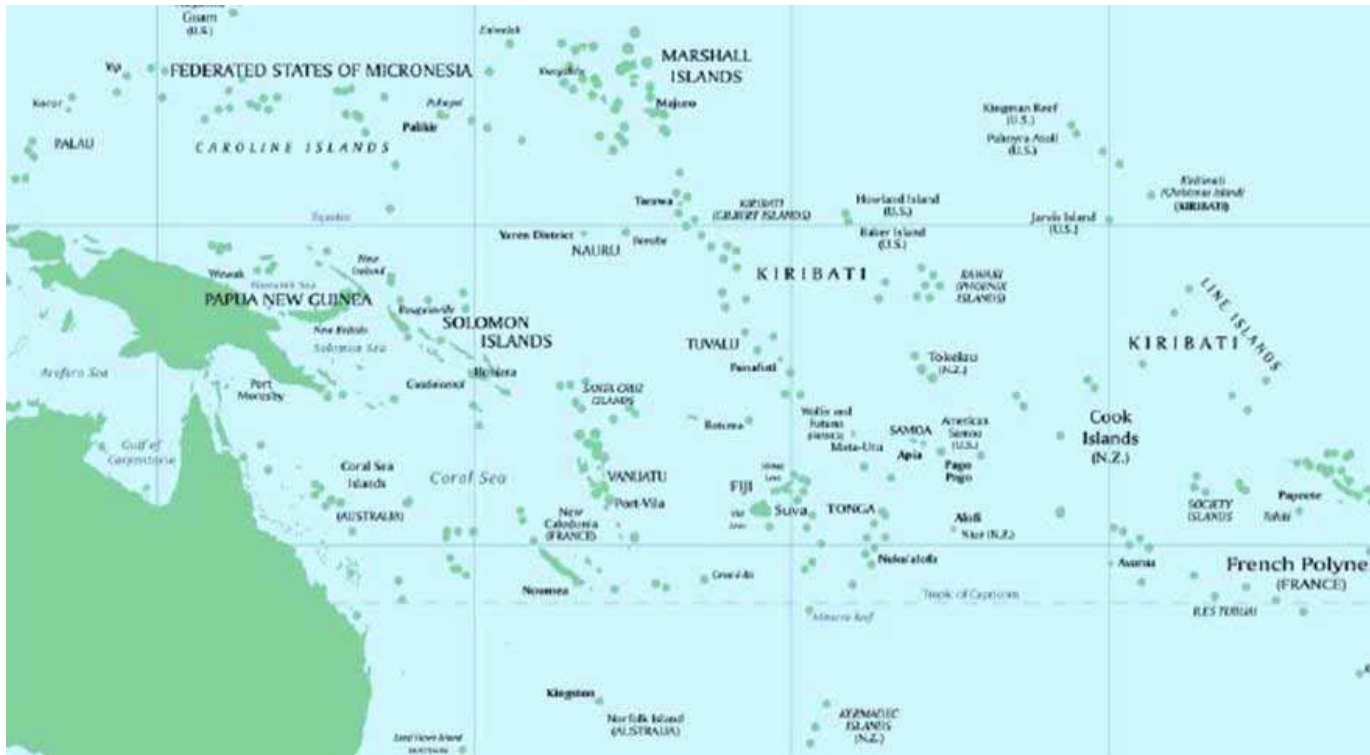
ISLAND-BASED ISOLATED GRIDS, GRID EXTENSION, & OFF GRID COMPLEMENT PLANNING

## PROPOSED LOAN

### RENEWABLE ENERGY FOR ELECTRIFICATION (1,000 islands) PROJECT

FUNDING SOURCES: World Bank, KfW  
FUNDING AMOUNT: US\$ 600 million

# Snapshot of the Pacific



Country	Population	Access to electricity (%)
Fiji	860,623	75
Kiribati	99,546	45
Marshall Islands	54,038	50
FSM	111,064	45
Palau	20,472	95
Papua New Guinea	6,858,266	13
Samoa	183,081	95+
Solomon Islands	538,148	< 20
Timor-Leste	1,124,355	22
Tonga	104,058	95+
Tuvalu	9,827	95+
Vanuatu	239,651	27
<b>TOTAL</b>	<b>10,203,129</b>	<b>~20</b>

Estimated figures for illustrative purposes.

# Pacific energy issues

## ✓ *Import Dependence and Vulnerability:*

- Imported petroleum fuels ~ 99 % of commercial energy use (in PNG 60%; in Fiji 20%)
- Expenditure on petroleum imports ~ 10%-25% of GDP in small PICs.



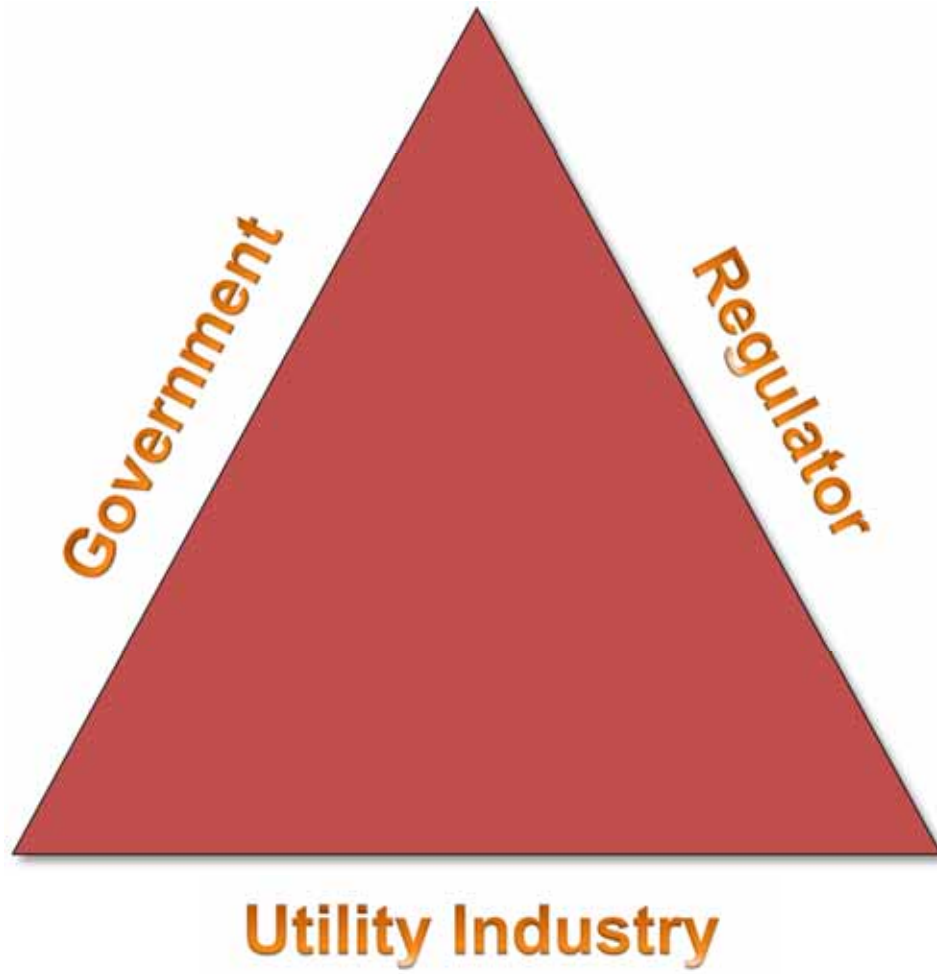
# Pacific energy issues (cont.)

- ✓ ***Affordability:*** Electricity prices are among the highest in the world (18-80 US¢/kWh) [high fuel prices and operational inefficiencies]
- ✓ ***Lack of adequate capacity and reliable data for energy planning***



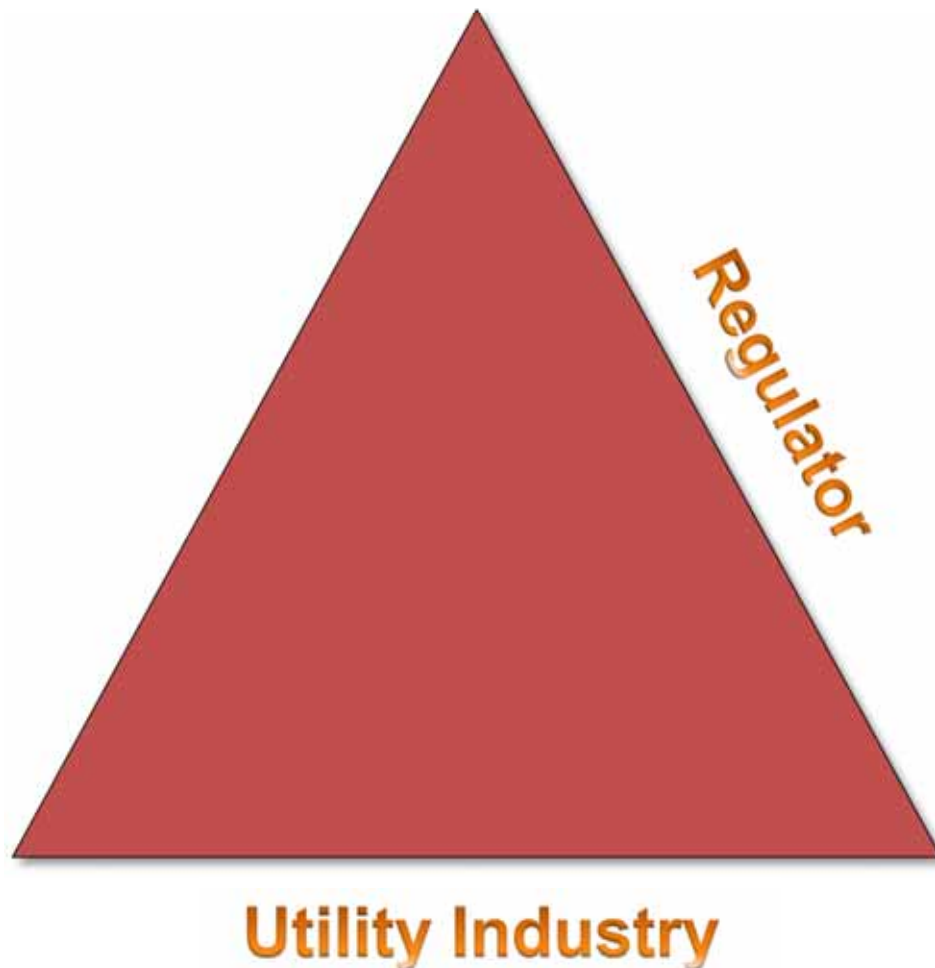
- ✓ ***Weak legislative, regulatory and institutional arrangements***

# The Energy Triad





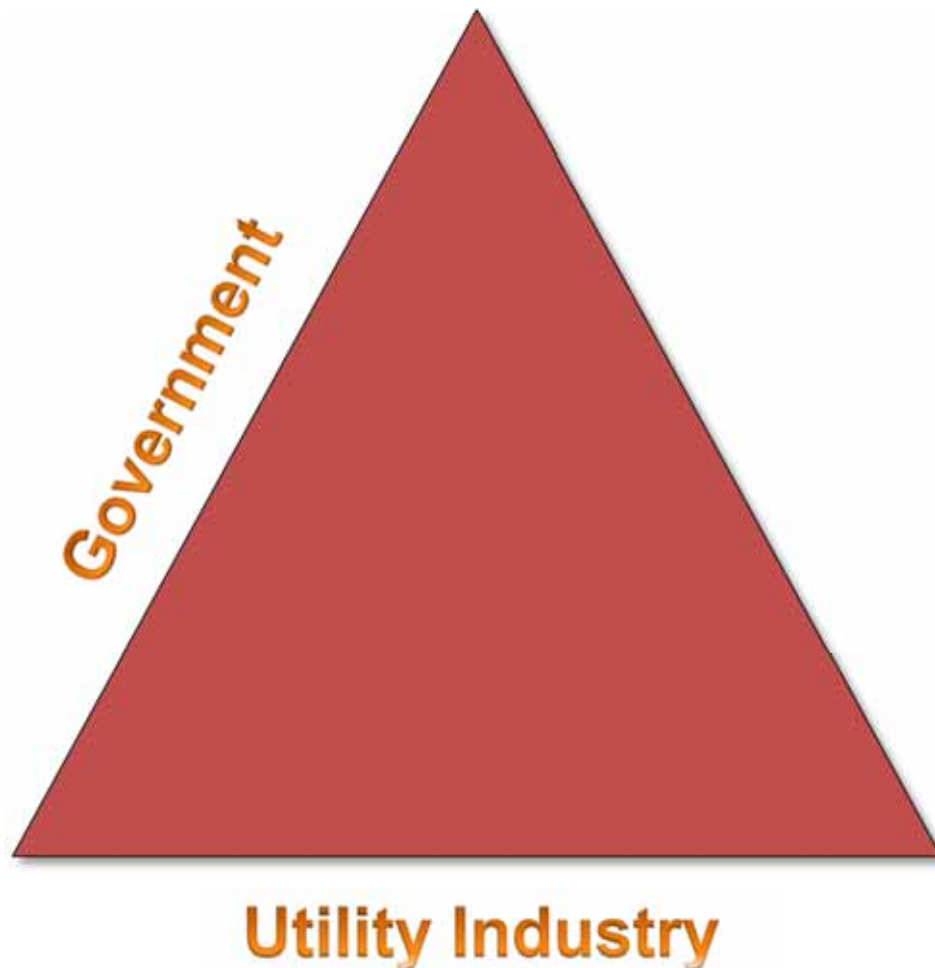
# The Energy Triad



## Weaknesses

- Lack of sector vision, long-term goals and M&E
- Unclear sector investment and operating environment

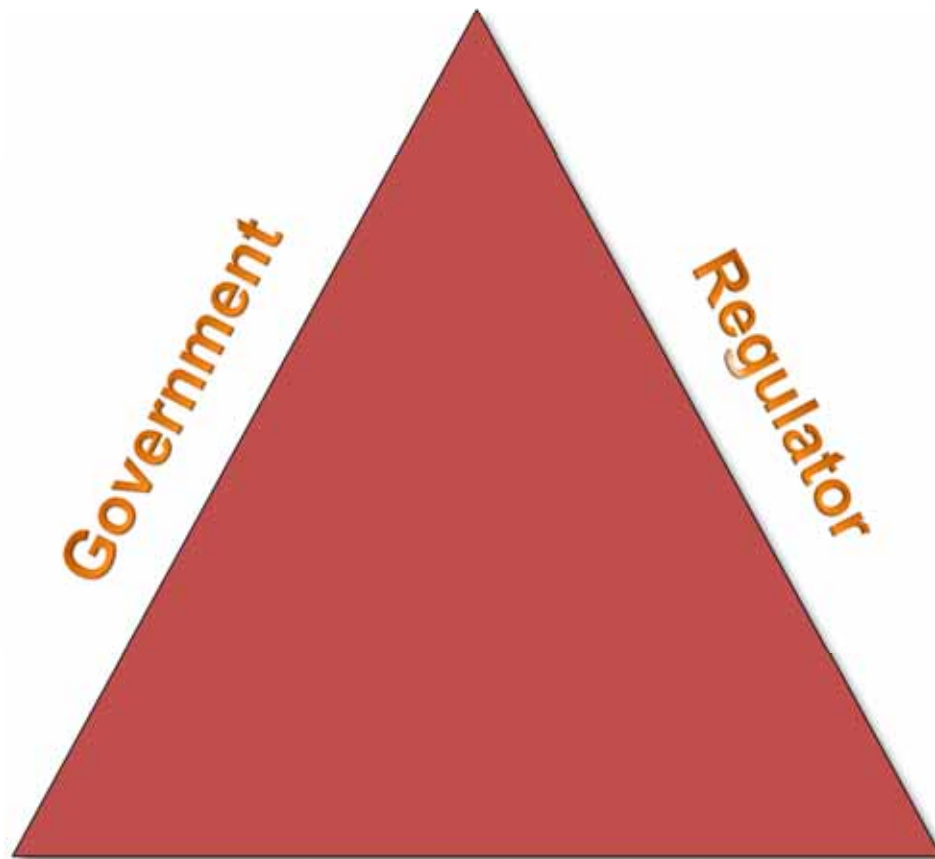
# The Energy Triad



## Weaknesses

- Lack of independent oversight
- Utilities managed for political and social objectives rather than for efficiency

# The Energy Triad



## Weaknesses

- Failure to develop and retain body of technical and managerial expertise
- Limited ability to attract financial and technological resources

# Results

## Governments:

- Management by crisis and ad hocery
- Inefficient operation of utilities and lack of maintenance of energy infrastructure
- Under-investment in energy sector and human capital

## Donors:

- Shy away from comprehensive energy solutions
- Limit support to off-grid renewable technologies

## Private Sector:

- Low investment and few public-private partnerships

## **Tonga Case Study:**

**12 donors + 20 years + \$52 million in aid = 1000 SHS**



# The Tonga Energy Roadmap

TERM Media Releases Energy Reports Links Page

## Latest Articles



### Tonga Energy Road Map completes plan to transform energy sector

NUKU'ALOFA, Tonga: Leading energy experts from Tonga and its Development Partners in April completed the final draft of Tonga Energy Road Map (TERM) setting out a high level vision over 10 years for the transformation of Tonga's energy sector. – TERM Press Release

### IRENA signing, a milestone for Tonga's renewable energy plans



ABU DHABI, UAE: On June 24, in Abu Dhabi, IRENA and the Kingdom of Tonga will hold an official Signing Ceremony of the IRENA Abu Dhabi Declaration on the Tonga Energy Road Map 2010-2020. The successful, on-going partnership between IRENA and the Pacific

June 24, 2010 | 0 comments | [View Post](#)

### Framework for Action on Energy Security in the Pacific



NOUMEA, New Caledonia: Energy, national planning and utility representatives from around the Pacific met in Noumea to discuss the SPC's role in the energy sector and agree on a new Framework for Action on Energy Security in the Pacific. Tonga was represented by Lano Fonua

### Final Report Tonga Energy Road Map 2010-20

Final Report June 2010. 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. A new approach to donor coordination. 97 pages. TERM Final Report 18\_06\_2010.pdf [Download file 1.4MB](#)

June 18, 2010 | 0 comments | [View Post](#)

### Regional Workshop on Wind Data Analysis



NADI, Fiji: A SPREP funded Regional Workshop on Wind Data Analysis took place from April 26-30 at Nadi's Tanoa International Hotel. Organised under the PIGGAREP initiative the workshop was conducted by Danish wind industry expert Mr Svend Enevoldsen.

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## Partners



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Do you understand the elements that make up Tonga's Electricity Tariff?

- Yes
- No



# A Whole-of-Sector approach

- **The government in the driver's seat: Coordinates all relevant stakeholders**
- **The development partners coordinate and fund the TA required to undertake an analytically robust energy planning process**
- **Least-Cost Approach to meet energy service delivery and macroeconomic stability objectives**
- **Clear, appropriate and effective definition of roles for Government, Utilities, and the Private Sector**
- **Technical and Financial Sustainability**
- **Environmental and Social Sustainability**

# Conclusions

- **RE microgrids meet objectives of access, source diversification and price stability**
- **If you can't compete on cost-of-service in the Pacific, go home!**
- **Robustness and maintainability are key**
- **It's the policy and institutional environment, stupid!**



Malo,  
Thank You