

# ICAO CAPACITY BUILDING SEMINAR ON LOW EMISSIONS AVIATION MEASURES

SUPPORTING SIDS AND THEIR AVIATION STAKEHOLDERS IN SELECTING MEASURES FOR  
STATE ACTION PLAN ON CO<sub>2</sub> EMISSION REDUCTION ACTIVITIES

**Peceli Nakavulevu, PSE, PCREEE**

# OUTLINE OF PRESENTATION



Pacific  
Community  
Communauté  
du Pacifique

1. Background & Context
2. Regional Renewable Energy Development in PICTs
3. The Paris Agreement and its Implication in the PICTs
4. Case Study – Asia & Oceania on Renewable Energy Development
  - a. Obstacle to the Development of RE
  - b. Renewable Energy the Game Changer
  - c. Developments of the RE Industry
  - d. Future Development in the RE Sector
5. Initiatives at the Airports
6. PCREEE Formation & Establishment



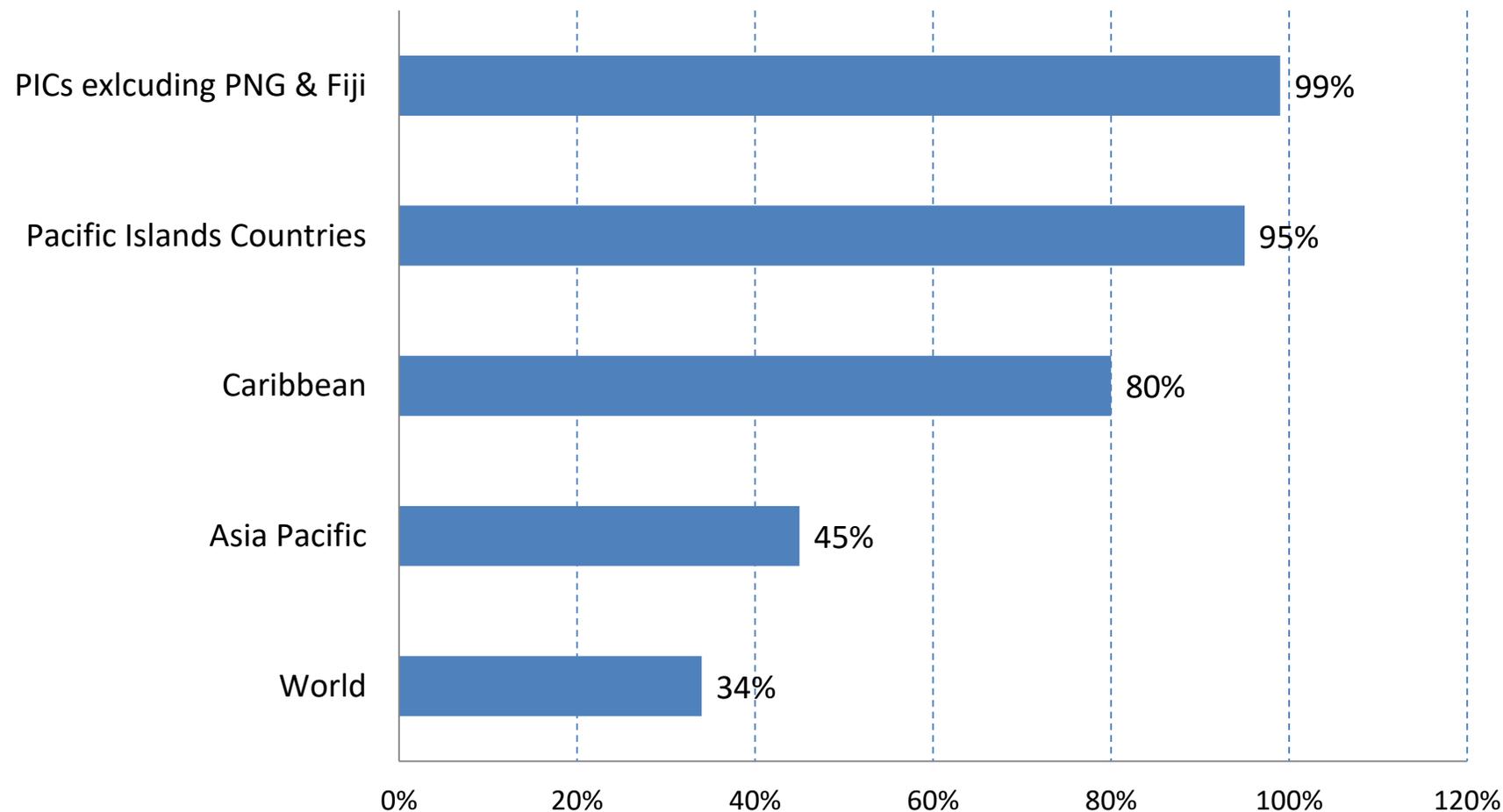
Pacific Centre for Renewable Energy and Energy Efficiency

SE4ALL Centre of Excellence to Promote Sustainable Energy Markets, Industries and Innovation

# BACKGROUND & CONTEXT

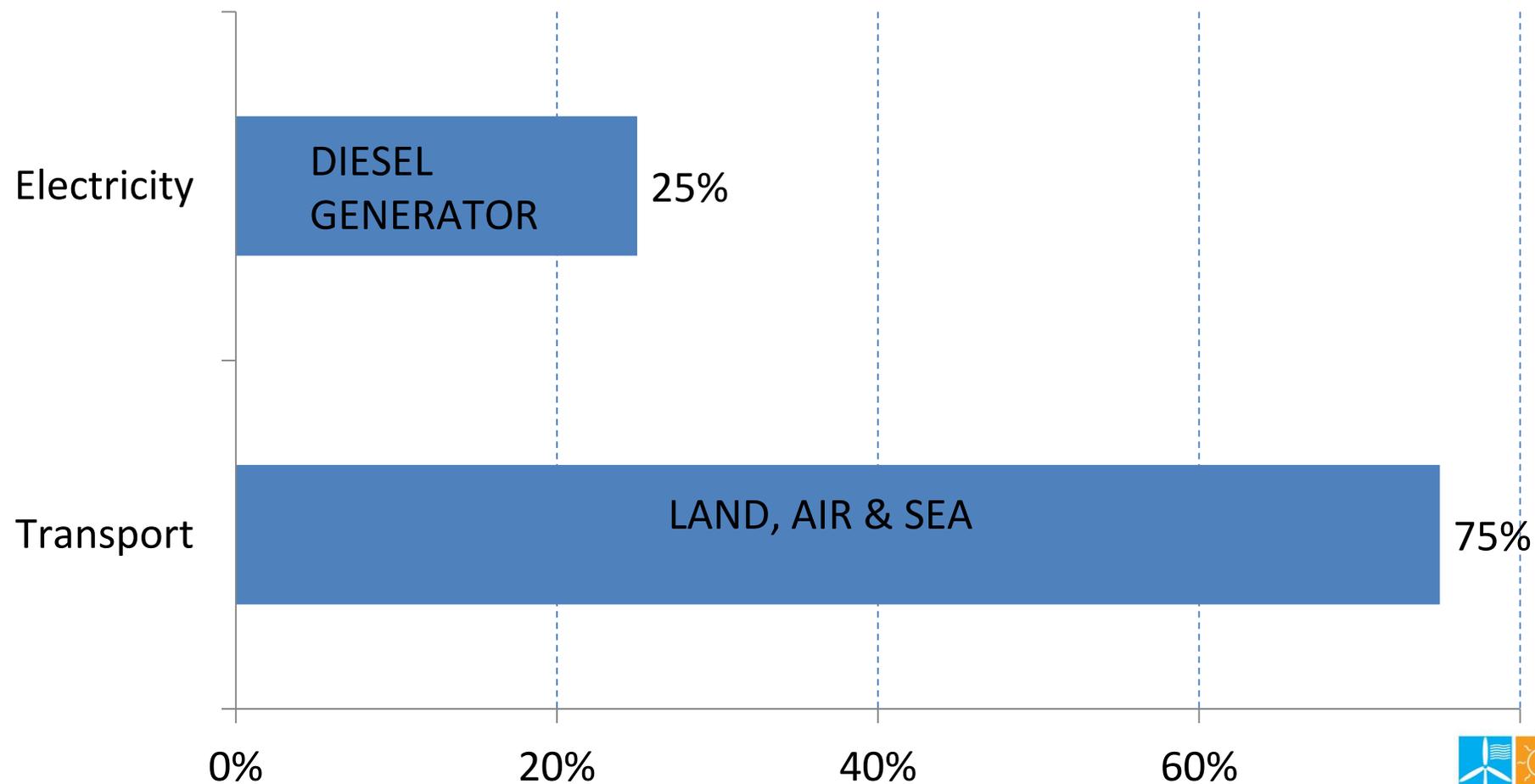
- PICTs is the most vulnerable to climate change
- PICTs economies are fairly weak
- Heavy oil dependency make economies more vulnerable to external shocks
- Oil Price Vulnerability Index for 19 Asian and 5 Pacific Island Countries (Fiji, PNG, Samoa, Solomon Is & Vanuatu) showed that of the 13 most vulnerable countries, 4 were from the Pacific. Of the PICs, Vanuatu was the most vulnerable, followed by the Solomon Is, Samoa and then Fiji.
- Fiji's Imports Increased by almost 25% in 2008 due to the higher cost of petroleum.
- In 2009, Fiji's economy contracted by 2.5% while Palau was by 3%.
- Inflation Rates in Kiribati & RMI soared In 2008 by 18.6% and 17.5% respectively.

## Context: Extreme Petroleum Dependency in the Pacific

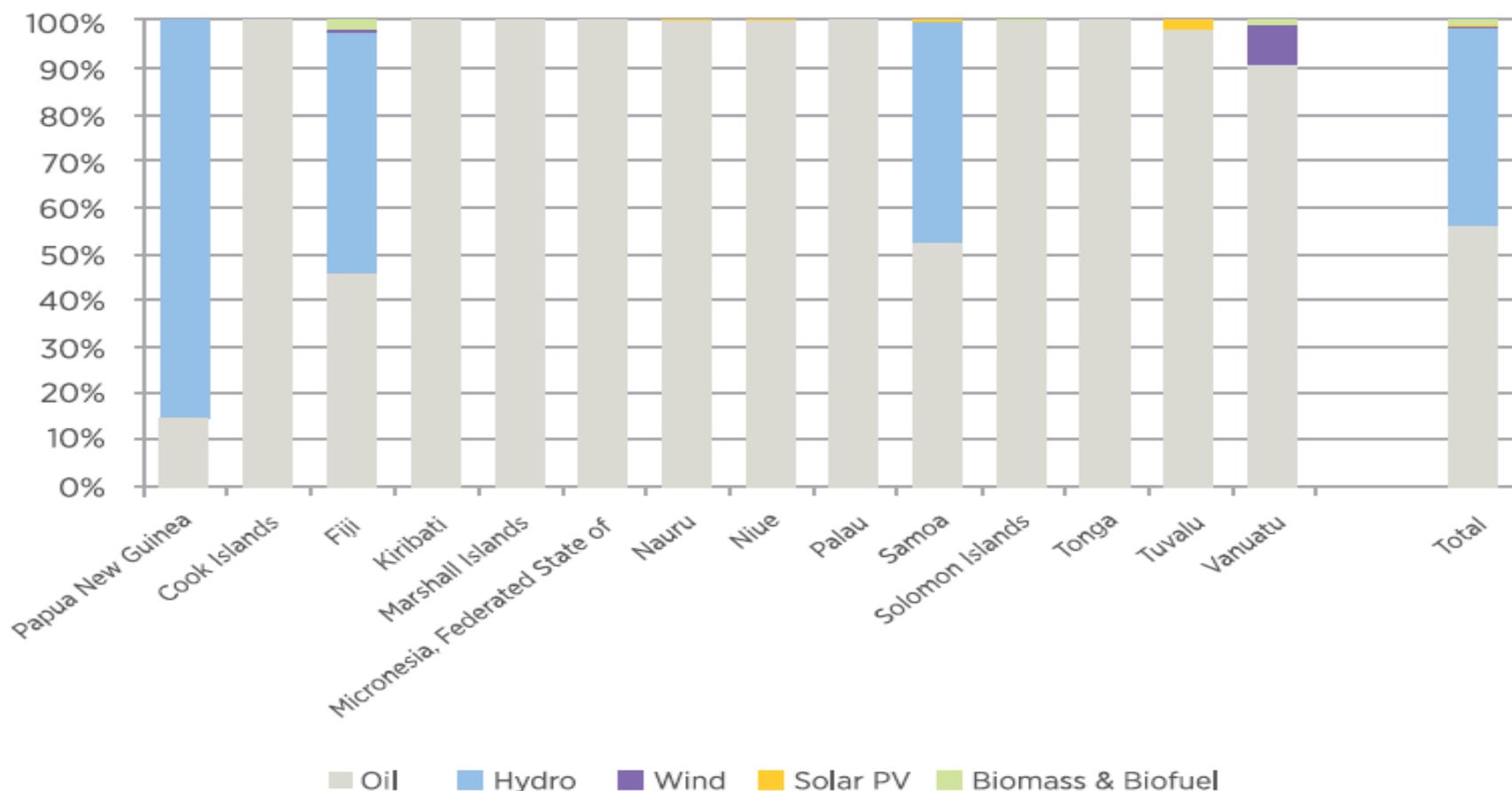


Source: International Energy Agency (2009) & ADB Report (2009)

# Petroleum Fuel end-use in PICs



# 2015 – POWER UTILITY IN THE PACIFIC ISLANDS



- illustrates the overwhelming dependence of almost all PICTs on diesel power generation. Large hydropower is the second contributor in terms of electricity generation; however, this resource is limited to specific geographic characteristics (mountainous and large land areas).

# OTHER REGIONAL ISSUES

- PICTs must address the **interrelated challenges of fossil-fuel dependence, climate change and particular geography**, which affect their energy security and contribute to the region's economic and social challenges
- Unique geographical characteristics, where long distances separate sparsely populated areas or markets are too small to achieve cost savings through economies of scale in electricity production, result in high costs of supplying electricity, particularly to rural areas.
- A study by UNDP / GEF in 2005 on the opportunities and constraints for the expanded use of renewable energy in 15 PICs concluded that for a third of them, about 40-80% of fuel savings and reductions in GHG emissions would probably be met technically more easily from energy efficiency investments than from renewables.

# RENEWABLE ENERGY DEVELOPMENT IN PICTS



## THE COMMITMENTS

LEADERS REAFFIRMED  
THEIR COMMITMENT  
TO RENEWABLE  
ENERGY AND ENERGY  
EFFICIENT FUTURE  
BASED ON ACHIEVABLE,  
PRACTICAL AND  
VOLUNTARY TARGETS.

(2010)



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## Towards an energy secure Pacific

A Framework for Action on Energy Security in the Pacific

Energy security exists when all people at all times have access to sufficient sustainable sources of clean and affordable energy and services to enhance their social and economic well-being

2010 – 2020



Leaders endorsed the Framework for Action on Energy Security in the Pacific (2010 -2020)

*“Energy Security exists when all people at all times have access to sufficient sustainable sources of clean and affordable energy and services to enhance their social and economic well-being”*

# 2011 FORUM LEADERS COMMUNIQUÉ

1. Leaders agreed on the value of developing credible whole of sector plans such as **“energy road maps”** and structures to improve energy security, **reduce dependency on fossil fuel** for electricity generation and improve **access to electricity**.
2. Leaders expressed support for the development of effective **management of fuel supply risks**, meeting energy **efficiency targets** including expanding the existing electrical appliance **energy efficiency standards and labelling** programme to help realize significant energy savings.

# ENERGY ROADMAPS & PLANS

- 2010 – Tonga Energy Roadmap (TERM)
- 2011 – Cook Is RE Chart (CIREC)
- 2012 – Samoa Energy Plan
- 2012 - Vanuatu Energy Roadmap
- 2013 – Nauru Energy Roadmap
- 2014 – Solomon Is Energy Policy and Action Plan
- 2015 – Niue Strategic Energy Roadmap
- 2017 – Kiribati Energy Roadmap



His Majesty's Government of the Kingdom of Tonga

# TONGA ENERGY ROAD MAP 2010 - 2020

A TEN YEAR ROAD MAP TO REDUCE TONGA'S VULNERABILITY TO OIL PRICE SHOCKS AND ACHIEVE AN INCREASE IN QUALITY ACCESS TO MODERN ENERGY SERVICES IN AN ENVIRONMENTALLY SUSTAINABLE MANNER

FINAL REPORT

June 2010



## Niue Strategic Energy Road Map 2015-2025

# Kiribati Integrated Energy Roadmap: 2017-2025



July 2017



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# 2013 FORUM LEADERS COMMUNIQUÉ

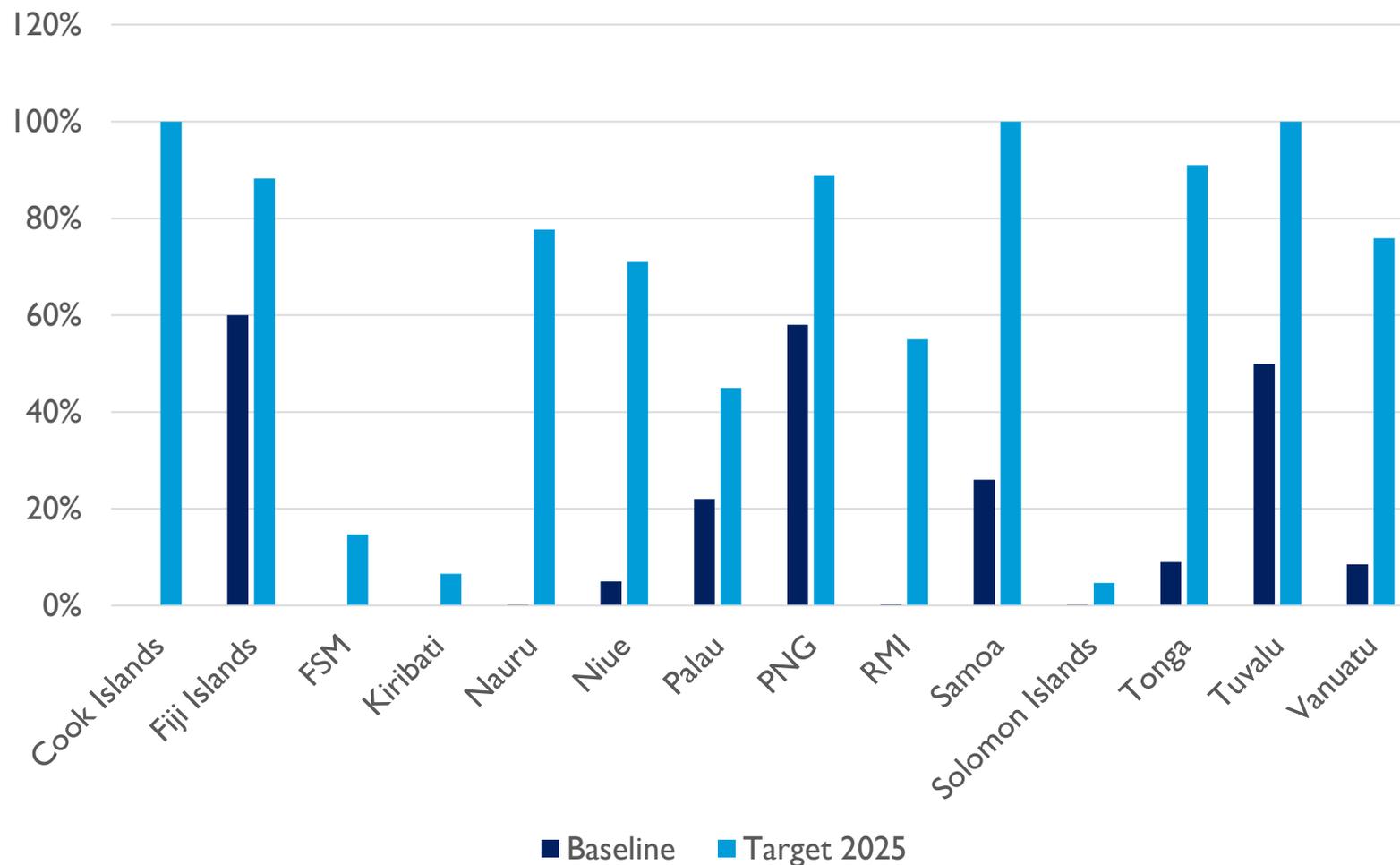
- Leaders endorsed the Majuro Declaration for Climate Leadership.
- The Declaration is intended to highlight the Leaders' strong political commitment to be the region of Climate Leaders, and is an effort to spark a new wave of climate leadership that accelerates the reduction and phasing down of greenhouse gas pollution worldwide.
- Contained the PICs energy targets

# THE PARIS AGREEMENT IN 2015 & IMPLICATION

1. The Paris Agreement (PA) has been hailed as a major global achievement to salvage the world.
2. The PA called for all parties to limit global temperature change to well below 2 degrees celsius above pre-industrial temperature levels.
3. Parties must therefore take actions to ensure that the temperature increase does not exceed 2 degrees above pre industrial levels.
4. Recognising that this level of warming would be too high for many vulnerable nations, the Paris Agreement **encourages Parties to be ambitious** and calls for countries to make further progress to limit warming to no more than 1.5 degrees Celsius above pre-industrial levels.

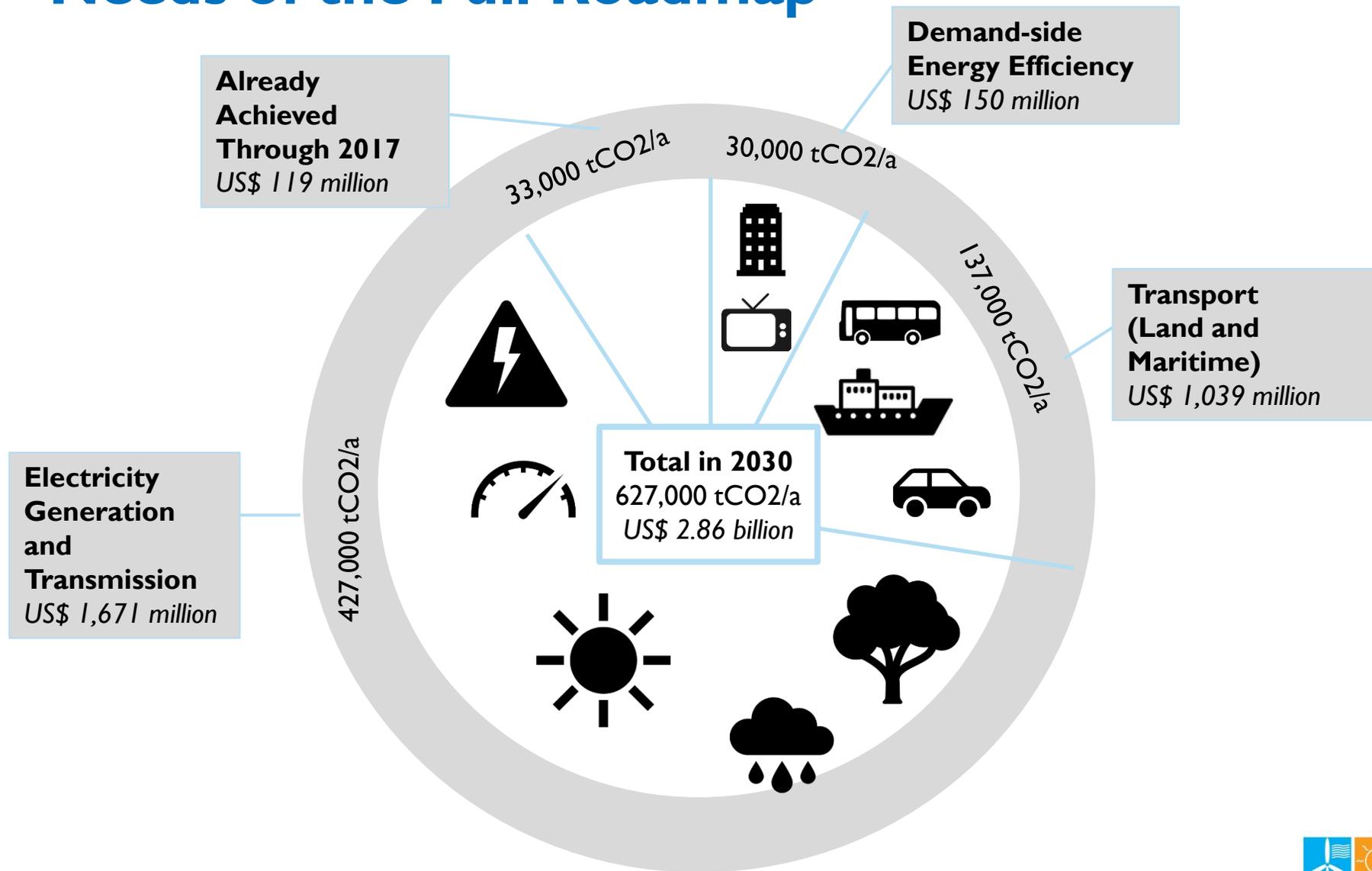
- Efforts aimed at the 1.5 degree target are to be supported by the **obligation** of all countries to relook at their low carbon emission development strategies, most of which are (to be) contained in their **Nationally Determined Contributions**.
- As key proponents of the 1.5 degree target, the PICs' ambitions can be seen in the next few slides, where SPC has tried to bring all the targets together to a common year (2025).

Country	INDC targets	Target	Year
Cook Is	50% islands change from diesel to RE by 2015 to 100% coverage by 2020	38%	2020
Fiji	100% RE by 2030 from 60% in 2013. Reduce 10% emissions for EE improvements economy wide	100%	2030
FSM	Reduce emissions 28% by 2025 below 2000 emissions. Conditional - 35% by 2025 below 2000 emissions	14.7%	2025
Kiribati	Reduce emissions 13.7% by 2025 & 12.8% by 2030	6.58%	2025
Nauru	Solar PV installations worth USD 42 million. DSM improvements of USD 8 million. Unconditional - USD 5 million secured for 0.6 MW PV	50%	2020
Niue	38% RE of total generation by 2020 through to 2025. Of this, 10% reduction of electricity demand by 2020. Conditional - 80% RE by 2025	38%	2020
Palau	45% RE by 2025. 35% EE target by 2025	45%	2025
PNG	100% RE by 2030	100%	2030
RMI	Reduce emissions 32% below 2010 by 2025. Indicative - reduce emissions to 45% below 2010 levels by 2030	55%	2025
Samoa	100% RE through to 2025. Conditional - in reaching the target in 2017.	100%	2025
Solomon Is	Reduce emissions by 12% below 2015 level by 2025 & 30% below 2015 by 2030. Conditional - reduce 27% by 2025 & 45% by 2030, 50% by 2050	4.68%	2025
Tonga	50% RE by 2020.	50%	2020
Tuvalu	Reduce emissions from generation by 100% by 2025.	100%	2025
Vanuatu	100% RE by 2030.	100%	2030



**PICs INDC Energy Targets by 2025 (% of renewable energy in total electricity generation)**

# Expected Mitigation Results & Investment Needs of the Full Roadmap



# FORUM ECONOMIC MINISTERS

## MEETING: Koror, Palau

### 26-27 April, 2018



1. Globally, developed countries have committed to jointly mobilise up to USD 100 billion of climate change finance per year by 2020, for developing countries. Currently it is estimated that just over 50 billion has been mobilised globally. However, it is estimated that developing countries (including SIDs and LDCs) will require USD 349 billion a year to implement their National Determined Contributions (NDCs) for the next 15 years alone. ....
2. A significant portion of NDC targets by Forum Island Countries is “conditional” on the provision of international climate change finance. For example Fiji’s conditional NDC will require at least USD 500 Million, Vanuatu USD 400 Million, Solomon Islands USD 200 Million and Nauru 50 million.
3. Economic Ministers acknowledged the issues raised by the private sector and discussed the regional repository for government procurement for regional private sector, support for disaster risk management, focus on renewable energy and financing, and private sector representation.

#### Renewable Energy

- recognised that the private sector will be an important vehicle for supporting investment in renewable energy, in particular, local investments; and
- shared a vision with the private sector for the region becoming 100% reliable on self-generated renewable energies.



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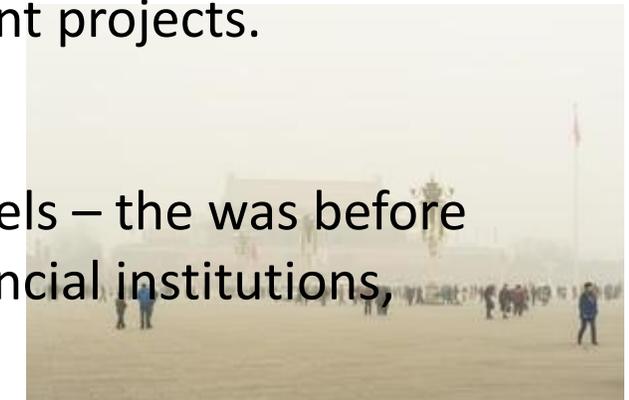
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## OBSTACLES TO THE DEVELOPMENT OF RE

- The biggest obstacle in the early years (2007 – 2008) – the lack of demand coupled, with high prices and the absence of appropriate policies to address FiT, PPA and Net Metering and the absence of financial incentives.
- The prices of solar has been high for sometime and also without the appropriate policies it has been difficult to achieve viability in RE.
- There were issues in terms of the technology itself where only 10% (rule of thumb) of RE was able to be integrated into the grid. For the Pacific these issues were real and Grid Stability etc kept creeping in.
- There have been major developments in energy storage something that was a far fetch some years ago. This has augured well for RE and also to an extent addressed some of the issues mentioned above. It was the missing link in the renewable energy revolution. Technological advances and falling costs have made batteries more attractive to consumers.

# RENEWABLE ENERGY – THE GAME CHANGER

- The Commitment by the 195 Countries to the Paris Agreement being the game changer in solar industry. With the agreement nations have pledged for a low carbon path to cut Green House Gas (GHG) emissions.
- For Singapore it was riding on its Green Building Initiative. This is where the training was focusing on, how solar could be integrated into a building. Govt also provided subsidy and even it was followed by a number of grants provided to implement projects.
- For China it was the Air Quality Levels that mobilised people at all levels – the was before the Beijing Olympics in 2008. Mobilizing stakeholders Including financial institutions, policy makers and individuals.

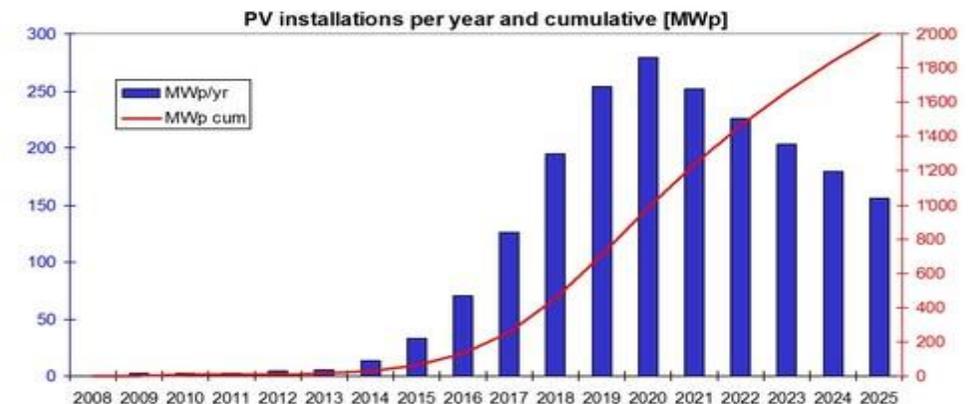
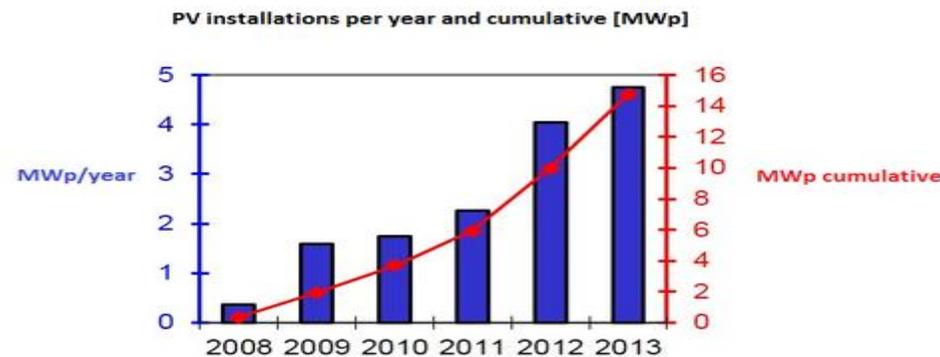


# RENEWABLE ENERGY – THE GAME CHANGER ... CONT

- The global solar industry has in the past decade enjoyed rapid growth, with total installed capacity growing more than 200 times from 806 megawatts in 2000 to about 175 gigawatts last year, according to the international renewable energy agency (IRENA). Growth of solar for the past decade ... from 806 megawatts in 2000 to 175 GW in 2017. In Singapore alone it has grown from 14 mwp in 2013 to 30 mwp last year – it doubled.
- Australia's Renewable Energy Target it is aiming to sources at least 33,000 GWh of its electricity from Renewable Energy Sources b 2020 and this make up about 23.5 % of the country's total electricity supply.
- Battery growth has been tremendous (particularly in Australia). It has been estimated that more than 20,000 home batteries were installed in Australia in 2017 (a 3 fold increase over the previous years). It does not end there and research is still continuing in terms of comparing Lithium ion based batteries and Zinc bromine flow batteries

# DEVELOPMENTS IN THE RENEWABLE ENERGY INDUSTRY IN ASIA & OCEANIA

- Investment in solar has been rapidly rising and in 2014 solar and made up almost half of total clean energy investment in 2014. Solar saw US\$149.6 billion committed, up 25 per cent on 2013, according to research from Bloomberg New Energy Finance.



- It was at this time the concept of Solar Leasing – Power Purchase Agreements were introduced. – the concept is basically the solar company offers full range of solar services to install systems worth little or no upfront costs. The arrangement allows building owners to begin saving on energy bills without huge initial investment and solar firms to have a predictable cash – flows.
- From 2010 to 2012 the cost of solar modules dropped by up to 70%. The decrease in prices was the result of the withdrawal of subsidies in the EU Markets and the Chinese Manufacturing was skyrocketing . Even the installation cost was reduced by about 50%.

# DEVELOPMENTS IN THE RENEWABLE ENERGY INDUSTRY IN ASIA & OCEANIA .... CONT

- The Singapore Government has set a target of 350 MWp of solar by 2020. Despite the restrictions in land availability stakeholders have stated that they are able to go to 2 GWp of PV Capacity mindful of the available roof capacity.
- Grid stability is also an issue that needs to be considered by solar investors.
- RE provides long term stability in terms of PPA that ranges from 20–25 years.
- Depending on size of the PV System the price of solar energy ranges from 12 to 18 cents per kWh moving closer to “Grid Parity”. The tariff from conventional power is about 20 cents. This occurred in Singapore because of Government Intervention / initiatives.
- The prices of solar has been high for sometime and also without the appropriate policies it has been difficult. With the new prices companies are achieving a payback of 8 years. Unfortunately this was not possible in other parts of Asia such as Indonesia and Vietnam where the electricity tariffs were low.



# FUTURE DEVELOPMENT IN THE RENEWABLE ENERGY SECTOR

- First pillar – the concept of distributed generation at the point of consumption – also offers unique solution for energy access / rural electrification.
- The second pillar is the development of electricity storage in the form of batteries, which allow building owners to stockpile the excess solar energy generated during the day to use at other times when the sky is overcast. Research and development in this area is continuing.
- The third pillar is the so-called smart grid, or “the ability of buildings to talk to each other. Using sensors and predictive software, smart grids aim to automatically direct electricity to where it is needed, increase energy efficiency, and integrate renewable energy sources into power networks. The technology is being tested on a small scale in many parts of the world, including Singapore, but it may be a few years before smart grids are used by utilities to manage electricity flow in towns and cities.



# OTHER DEVELOPMENTS IN RENEWABLE ENERGY

- Renewable energy providing record shares of electricity (and growing) in countries such as the UK, Germany and even parts of the US.
- The World largest lithium ion battery goes online – The Tesla Powerpack has delivered a 100 MW lithium ion battery in South Australia to address its rolling blackouts. Was put to the test last year November when a coal plant tripped and it injected 100 MW into the grid in 140 milliseconds.
- Time for Big Oil to go Green - Research has projected decline in demand for fossil fuels and have urged companies to invest in renewable energy to stay competitive.
- New Innovations for Clean Energy – ( continue development of solar cells, the use of wireless technologies, battery technologies etc.).
- Deepening divestments in the fossil fuel space – Other parts of the world; WB, Dutch Banking and even AXA announced to divest from fossil fuels. Australia Banks now implementing policy to stop loans to new coal and mining projects.
- Reach Grid Parity the point where the price of Renewable Energy Investment is competitive or similar to conventional form of energy.
- The need to for Government to talk to the stakeholders (the private sector, financial institutions etc.) in terms of formulation of policies and this has been demonstrated in Singapore where the SEAS has been taking the lead role.



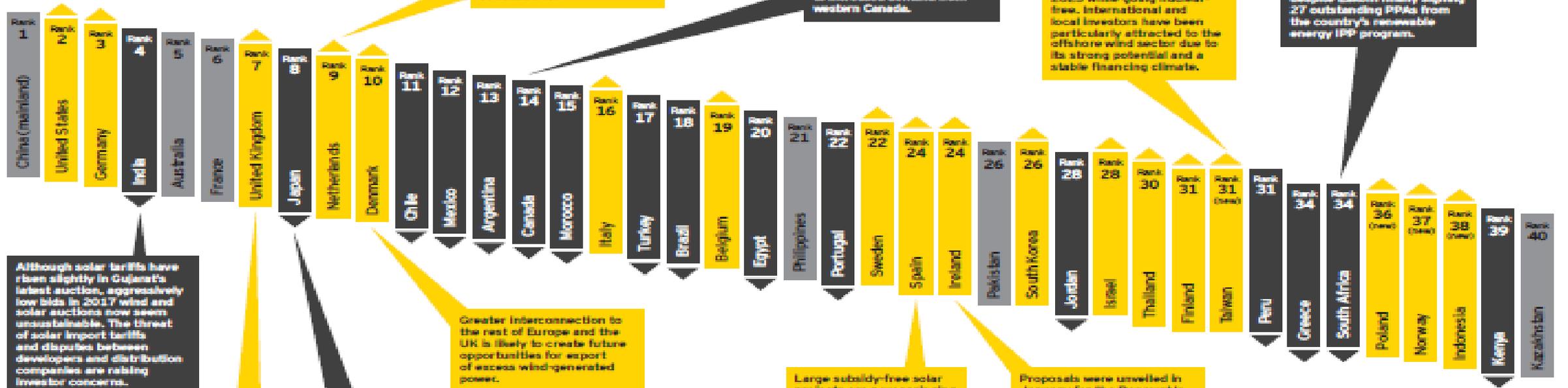
The Albany Wind Farm in Western Australia. As the country moves to increase the share of renewables in its energy mix, it will need to rely on storage technologies to keep the electricity system reliable and resilient.

# RENEWABLE ENERGY COUNTRY ATTRACTIVENESS INDEX

Renewable energy country attractiveness Index

# recai

May 2018



Renewables are expanding fast, as the Netherlands strives to meet its 14% EU target in 2020. Recent offers for unsubsidized offshore wind and a growing solar PV market are strong contributors.

Canadian wind installations fell sharply in 2017 to 340MW from 700MW in 2016 as eastern provinces cooled. Auctions such as the 700MW tenders in Alberta provide some optimism, pointing to increased demand from western Canada.

Taiwan has been taking action to increase renewables to 20% by 2025 while going nuclear-free. International and local investors have been particularly attracted to the offshore wind sector due to its strong potential and a stable financing climate.

Amidst coal-fired opposition, uncertainty continues for further new development, despite Eskom finally signing 27 outstanding PPAs from the country's renewable energy IPP program.

Although solar tariffs have risen slightly in Gujarat's latest auction, aggressively low bids in 2017 and solar auctions now seem unsustainable. The threat of solar import tariffs and disputes between developers and distribution companies are raising investor concerns.

Greater interconnection to the rest of Europe and the UK is likely to create future opportunities for export of excess wind-generated power.

Large subsidy-free solar projects are now springing up, such as a 170MW PPA between BayWa UK and Statkraft, and a 660MW PPA between Audax Energia and Cox Energy.

Proposals were unveiled in January for the Renewable Electricity Support Scheme (RESS) with tech-neutral auctions due from mid-2019 replacing the former RFFIT scheme. A new north-south interconnector has been approved, supporting plans for an extra 4.5GW by 2030.

Following a large drop in renewables investment in 2017, the UK is bouncing back, with subsidy-free solar PV and offshore wind projects for merchant generation as well as repowering of old wind farms.

More than 80 solar company bankruptcies have been reported in the past year due to sharp cuts in feed-in tariff (FIT) rates and extreme competition.

### Methodology

The index was recalculated in 2017, with all underlying datasets fully refreshed. To see a description of our methodology, please go to [epi.com/real](http://epi.com/real).

### Legend

- Increased attractiveness compared with previous index
- Decreased attractiveness compared with previous index

# INITIATIVES AT THE AIRPORTS

- On Energy aspect the need to look at both the utilisation of renewable energy and energy efficiency in your development or initiatives to move forward. According to the IEA - Energy efficiency is the most definitive energy supply that exists and harnessing these potential has enormous benefits for economies around the world.
- In addition direct benefits are derived in the form of lower costs in the area of generation, transmission and distribution, improved reliability and the possibility of delaying or deferring costly system upgrades, are very real. At the same time allowing an investor to get more in terms of selling power to the grid.
- Incorporate a holistic approach in looking at implementing Low Carbon Emissions in the Airports (Energy Conservation / Efficiency (including both electricity and fuel), Waste Management, Water Management & Noise Pollution).
- Also in terms of implementation it is to be implemented together with ISO 50001 “Energy Management Systems” and it gives organization a recognized framework for developing and effective energy management system.
- Also with the Marine Technology Cooperation Centre looking at Green Ports (Fiji, Samoa, Solomon Islands and Tonga)



# PCREEE FORMATION & ESTABLISHMENT

- REGIONAL VALIDATION WORKSHOP
- ENERGY MINISTERS MEETING
- SIDS CONFERENCE, SAMOA PATHWAY



Theme: Sustainable energy and transport services for all in the PICTs 31 March-4 April 2014, Nadi, Fiji



# 26 April 2017 – launched the PCREEE in Tonga

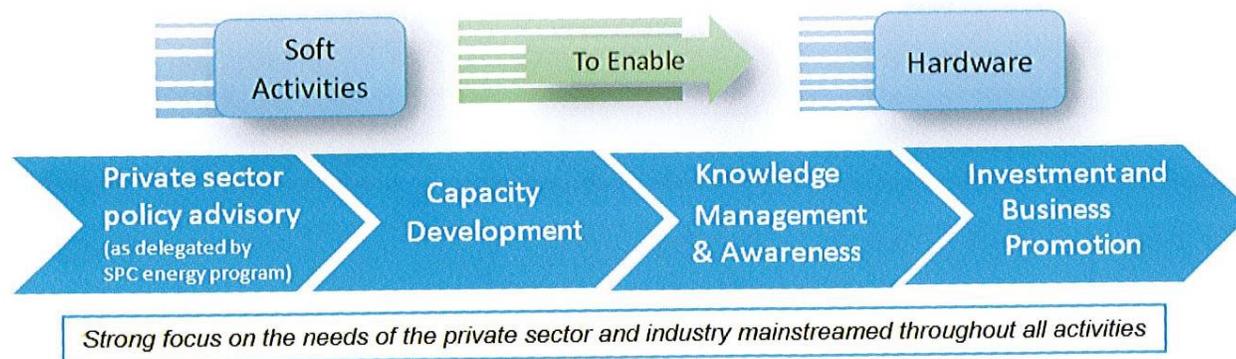


## 2013 UNIDO – SPC STUDY ON REGIONAL ENERGY SERVICE DELIVERY IN THE PICTS

- **PROGRESS IS SLOW**

- There still exists a broad range of barriers which need to be addressed, in order to take full advantage of RE & EE potentials.
- While the potential for RE resources is considered high, significant barriers for the development of commercially driven and sustainable energy markets.
- Lack of appropriate policies, capacities, knowledge, finance and the respective business environment are constraints that restrict the dissemination of RE & EE technologies and services.
- Apart from large hydropower, so far only a small fraction of the grid-connected electricity produced is from renewable sources such as PV, wind and biomass/biofuels.
- The off-grid and decentralized sector particularly in rural areas (e.g. mini-grids, stand-alone systems) remains underdeveloped in the PICTs with significant rural populations.

- The PCREEE is in line with the decision of the Ministers in Energy in PICTs in 2010. The project aims to address gaps in the current effort to face existing barriers and strengthen drivers for sustainable energy markets, industries and innovation. The Centre focuses on up-scaling and replicating national efforts in the areas of capacity development, knowledge management, innovation, awareness raising and as well as investment and business promotion.



- Development Objective : Improved access to modern, affordable and reliable energy services, energy security and mitigation of negative externalities by promoting renewable energy and energy efficiency investments. Markets and industries in PICTs.

# 1. PCREEE SUSTAINABLE ENERGY ENTREPRENEURSHIP SUPPORT FACILITY - PSEESF

- Support to the setting up new businesses relating to sustainable energy
- No cash grants but a technical facility
- Market studies, packaging of loan proposals, TA on preparing tenders, mentoring by established sister businesses in the region
- Seed funding of 50,000 Euro p.a for the next 4 years
- Partnership with GGGI's Youth Green Entrepreneurship Programme

## 2. PCREEE SUSTAINABLE ENERGY INNOVATION COMPETITION

- To promote technical innovation in renewable energy and energy efficiency in the PICTs
- Innovation in capturing solar, wind, hydro, tidal and wave energy
- Innovation in reusing waste heat
- Real experiences in the industrial, tourism and the manufacturing sectors
- Separate competition for the senior classes in secondary schools

### 3. PCREEE SUSTAINABLE ENERGY RESEARCH SUPPORT FUND

- Support Pacific Islands tertiary students to conduct research relating to sustainable energy in the Pacific Islands
- Two awards to date

## 4. PCREEE BUSINESS DEVELOPMENT TRAINING PROGRAMME (BDTP)

- raising the awareness about the business opportunities in the local energy sector
- promoting entrepreneurship and private sector investment in sustainable energy
- enhancing opportunities for private sector collaboration

# Malo 'Aupito