

RENEWABLE ENERGY BASED ELECTRICITY GENERATION IN THE PACIFIC ISLAND COUNTRIES

CHALLENGES AND OPPORTUNITIES

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Abstract

The Pacific Island Countries (PICs) face many challenges as their small population dispersed over millions of kilometers, advances toward sustainable development. Electricity generation using renewable resources and increased access are crucial for economic and social progress. This article provides a report on the electricity generation status of various PICs and describes the steps being undertaken to ensure all the Pacific islanders have access to sustainable energy.

Introduction

The term Pacific Island Countries and Territories (PICTs) comprises 22 countries and territories namely, American Samoa, Cook Islands, Federated States of Micronesia (FSM), Fiji, French Polynesia, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia, Niue, Northern Mariana Islands, Palau, Papua New Guinea (PNG), Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu and Wallis & Futuna. The PICTs straddle the most geographically isolated region in the world spread over 79 million square kilometers. This isolation and a small population — about 10 million with 6.7 million in PNG alone, dispersed over thousands of islands presents the region with unique challenges in its progress toward sustainable development. Figure 1 shows the PICTs with their SEZ demarcated. This article mainly deals with the independent Pacific Island Countries (PICs).

Challenges to sustainable development

Despite the immense natural resources available in the PICs, the overall economic, social, and environmental development has been sluggish. Three of the main barriers are the unsustainable dependence on imported fossil fuels, lack of modern energy services/ electricity, and climate change impacts.

Heavy dependence on imported fossil fuels

With the exception of PNG, none of the PICTs have any fossil fuel resources making them completely reliant on expensive imported petroleum products. According to an Asian Development Bank (ADB) study on the oil price vulnerability of 39 developing countries, the seven PICs included in the study (Table 1) were all among the top 10 most vulnerable countries (ADB, 2009).

This situation is also depicted in Figure 2. The average oil intensity in the region is more than 90% with some countries such as Cook Islands, Kiribati, Nauru,

Solomon Islands, and Tonga reaching almost 100% (Johnston, 2012). Barring Fiji, Tokelau, PNG and Samoa, all other countries and territories produce most of their electricity using fossil fuels.

Electrification status

Figure 3 shows the electrification status in the PICs with some countries having almost whole of their population connected to the grid. Unfortunately, the electricity generation in these countries is predominantly diesel based. On the other hand, countries such as PNG and Solomon Islands have only 10–15% of their population connected to any form of electricity.

Climate change impacts

Although the PICs produce a miniscule amount of greenhouse gases (about 0.03% of the global total), they stand at the frontline of the adverse impacts of global warming and sea level rise. There are many reports describing the increasing climate change-related threats on communities, infrastructure, water supply, coastal and forest ecosystems, fisheries, agriculture, and human health. At the 44th Pacific Islands Forum meeting held in Majuro, Marshall Islands, the government leaders while recognizing forum member countries' vulnerability to climate change, confirmed their climate leadership through "transition to renewable, clean and sustainable energy sources."¹

Current energy situation

As elsewhere in the world, PICs are gradually moving away from subsistence economies to monetary systems which lead to a rise in energy demand. As the income level of population and urbanization increases, demand for modern energy services such as electricity escalates. Weisser (2004) highlights that sharp increase in the price of oil can cause severe macroeconomic

¹Majuro declaration, <http://www.majurodeclaration.org>

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(balance of payments) consequences to oil importing low-income countries. This situation is amplified in the case of PICs where the petroleum import constitutes 10–30% of GDP. To reduce dependence on imported fuel, PICs have to promote renewable energy (RE) and energy efficiency in their countries (Table 2).

According to the Pacific Power Association's (PPA) benchmarking report, "most Pacific utilities charge consumers less than the full cost of supply" (PPA, 2012). This results in these utilities banking on government subsidies for their survival. In Fiji, there are no direct subsidies but the government facilitates tax-free import and guaranteed loans for RE projects.

Renewable energy resources in the PICs

PICs have abundant natural resources such as solar, wind, hydro, and biomass with hydro mainly in the Melanesian region. Table 3 shows the availability of RE resources in the PICs.

Despite the abundant renewable resources, the percentage of electricity generation from renewable resources is quite small compared to that from fossil fuels. There are three countries namely, Fiji, Vanuatu, and Samoa that generate substantial amount of electricity from RE sources. Some of the major RE resources being utilized presently are described below:

Solar energy: All the PICs are using solar PV for generation of electricity for off-grid and grid-tied systems. Samoa is the current leader in the PICs with 2.6 MW Grid-connected PV.² Tonga (1.32 MW) and Tokelau (1 MW) are other leading nations in the region. Fiji has a multitude of PV systems from 600 kW standalone systems in an island resort to more than 3,000 solar home systems spread in the rural areas.

Hydro power: PNG has the largest installed hydro capacity of 221 MW followed by Fiji with 130 MW. Samoa, Vanuatu, and Solomon Islands rank 3rd, 4th, and 5th in installed hydro capacity respectively. The rest of the PICs, which are mainly low-lying atolls, do not have any hydropower potential.

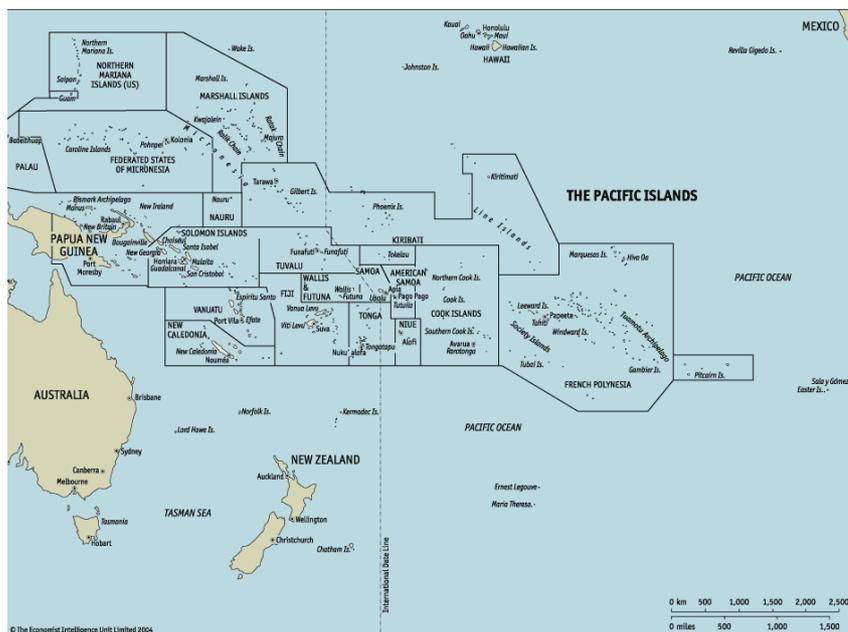


Figure 1: PICTs and their SEZ

Source: EIU, 2004

Table 1: Oil price vulnerability index for some PICs

Country	OPVI	Rank/39
Kiribati	1.00	1
Tonga	0.80	2
Fiji	0.79	3
Vanuatu	0.76	4
Solomon Islands	0.74	5
Samoa	0.73	6
Papua New Guinea	0.66	7

Source: ADB, 2009

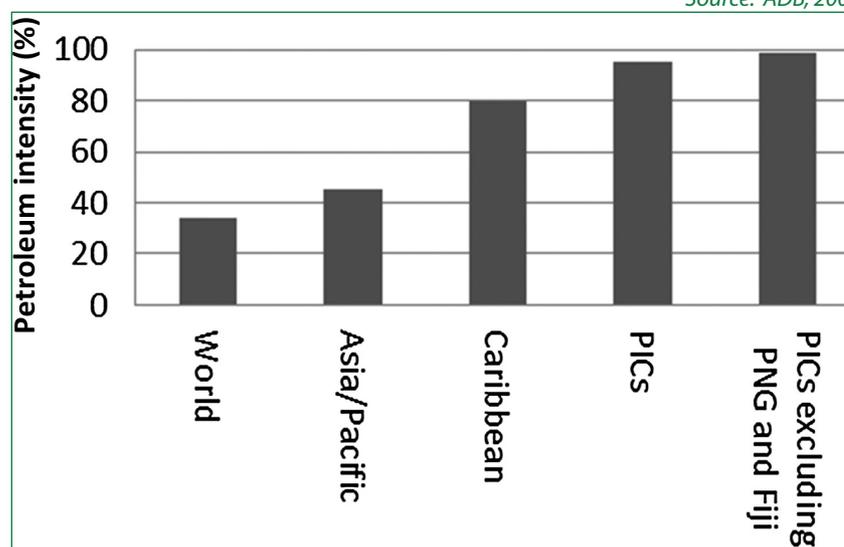


Figure 2: Average petroleum intensity

Source: Johnston, 2012

²A 2.2 MW GCPV system was launched on September 1, 2014 at the UNSIDS conference in Apia, Samoa.

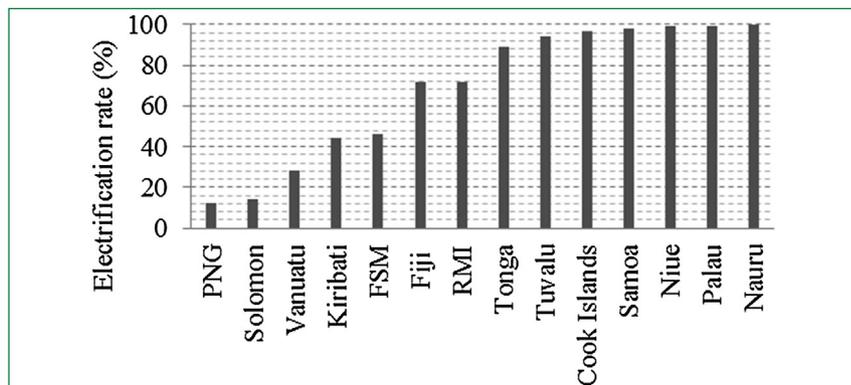


Figure 3: Population with grid-electricity
 Source: Pacific regional information system [PRISM]

Table 2: Electricity generation and petroleum consumption by some PICs

Country	Total electricity generation (2011) GWh	Total petroleum consumed (2011) barrels/day
Cook Islands	32.13	500
Fiji	836.1	9,000
Kiribati	25.0	400
Nauru	25.0	1,000
Niue	3.0	20
Samoa	115.2	1,100
Solomon Islands	85.0	1,500
Tonga	48.0	1,200
Vanuatu	55.0	1,000

Source: EIA

Wind energy: PICs in general do not have much experience with wind energy conversion systems. Currently, only three countries generate significant amount of electricity from wind with Fiji leading (10 MW) followed by Vanuatu (3.02 MW), and Samoa (600 kW). FSM and Tuvalu use windmills to pump water while the Cook Islands is actively exploring the opportunities.

Biomass energy: Fiji uses bagasse and sawdust as fuels for electricity generation. Almost all the PICs are using fuel wood for cooking and copra drying. Some PICs have operational biogas systems with an active program underway in Samoa.

Geothermal energy: At present, PNG is the only country within the PICs to have

a geothermal power plant (56 MW) with Vanuatu and Fiji actively investigating their geothermal resources.

Renewable energy targets

Almost all PICs have embarked on a mission to increase the share of RE in their electricity generation mix and have established targets. Table 4 shows the current situation and the RE electricity targets.

There is a concern that some of these targets and timelines are too ambitious and need to be prioritized. On the other hand, Tokelau has already realized its goal of 100% RE-based electrification and countries such as Fiji, Samoa do have realistic targets. Moreover, it has been shown that in the PICs, lifecycle costs of solar tech-

nologies are equivalent to those of small diesel or petrol systems (Dorman, 2012).

Enabling renewable energy development in the PICs

It is important that the PICs proactively tackle the challenges including the lack of access to sustainable energy (SE) that retard their progress toward sustainable development. To effectively create an enabling environment for RE proliferation, instruments that remove barriers, manage risks, and build momentum for sector-wide market transformation are required (UNDP, 2012). To ensure energy policy's success, it needs to be appropriately structured and implemented. UNDP outlines the following 4-step methodology for identifying and selecting an optimal instrument mix:

- (i) Identify priority RE technology options;
- (ii) Assess underlying barriers to technology diffusion;
- (iii) Determine an appropriate public instrument mix; and
- (iv) Set funding options for the public instruments.

Weisser (2004) suggests that in developing energy policies and planning guidelines, developing countries need to ensure that potential of RE technologies for providing electricity are assessed. Krupa (2012) suggests that removal of subsidies for fossil fuels, implementation of a comprehensive feed-in-tariff (FIT), a full accounting of impacts coupled with an accurate pricing scheme for electricity, and systemic public education outreach can increase RE contribution for electricity generation.

Considering the low percentage of renewable electricity generation in most of the PICs, a lot of work has to be done to achieve RE targets mentioned in table 3. The following sections present the current enablers in different PICs that support RE development.

Framework for accelerating energy security in the Pacific (FAESP): A PICT wide initiative

The Pacific regional energy ministers in their meeting in 2009 resolved to strengthen coordination of regional energy activities and

Table 3: Renewable energy resources in PICs

Country	Renewable energy resource					
	Solar	Wind	Hydro	Biomass	Geothermal	Ocean
Cook Islands	Yes	Yes	Yes, but costly	No surveys done	Unknown	Yes
Fiji	Yes	Yes	Yes	Yes	Yes	Yes
FSM	Yes	Yes	Yes	Yes, coconut plantations	Unknown	Yes, moderate resource
Kiribati	Yes	Yes	No	Yes	No	Yes but low
Marshall Islands	Yes	Moderate	No	Yes, only coconut for biofuel	Unknown	Yes
Nauru	Yes	Not well known	None	Insufficient	None	Little
Niue	Yes	Moderate wind resource	None	Unlikely due to protected forests	None	Yes
Palau	Yes	Monitoring not done	Limited	Very limited	Unknown	Yes
PNG	Yes	Monitoring not done	Yes	Limited	Yes	Little knowledge
Samoa	Yes	Still monitoring	Yes	Forest biomass not available. Has coconut resource	Yes	Little
Solomon Islands	Yes	No monitoring has been done	Yes		Yes	Yes
Tonga	Yes	Yes but coconut trees interfere with wind flow	No	Yes	Yes but uneconomical	Yes
Tuvalu	Yes	Yes	No	Yes, coconut	No	Yes
Vanuatu	Yes	Yes	Yes	Yes	Yes	Yes

Source: IRENA

Table 4: Current situation and the RE electricity targets

Pacific Island Countries & Territories	Current renewable energy electricity generation	Renewable energy electricity targets	
	Approximate % of total	% of total	Target year
Cook Islands	<1	50; 100	2015; 2020
Fiji	67 (2010)	90	2015
FSM		Urban 10; rural 50	2020
Kiribati (unofficial)	<1	10–30	unspecified
Marshall Islands	1	20	2020
Nauru	<1	50	2015
Niue	3	100	2020
Palau	3	20	2020
Papua New Guinea	46	No targets set	
Samoa	42	+20	2030
Solomon Islands	<1	50	2015
Tokelau	1	100	2012 (achieved)
Tonga	<1	50	2020
Tuvalu	2	100	2020
Vanuatu	19	65	2020

Source: IRENA, 2012 – Updated

donor assistance by bringing them under one regional organization and under one program. A new framework termed FAESP was developed in consultation with PICTs, development partners, regional agencies, and other stakeholders. The framework was endorsed by the regional leaders in 2010 and became the guiding document for PICTs energy policy development. There are seven pillars of this framework:

- i. Leadership, governance, coordination, and partnership
- ii. Energy planning, policy, and regulatory frameworks
- iii. Energy production and supply
 - a. Petroleum and alternative fuels
 - b. Renewable energy
- iv. Energy conservation
 - a. Energy efficiency and conservation
- v. End-use energy consumption
 - a. Electric power
 - b. Transport energy use
- vi. Energy data and information
- vii. Financing, monitoring, and evaluation

This 10-year (2010–2020) program “encompasses the Leaders’ vision for an energy secure Pacific where Pacific 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.” Two of the salient features of this framework are the “whole of sector” approach and “many partners one team” concept which recognizes the importance of various stakeholders involved in the development of an energy-secure region. Some of the major accomplishments under this framework are the publication of Energy Security Indicator Reports for 14 PICTs³ and recent establishment of the Pacific Regional Data Repository (PRDR).⁴

Tax incentives and duty concessions

Various PIC governments have established tax rebates and other concessions to encourage RE development. Some examples are:

Fiji

Fiji has zero import duty on RE equipment and there is a 7-year tax holiday for potential

investors willing to invest in RE-based companies in Fiji. For biofuel production, any company investing FJD 1 million is eligible for a 10-year tax holiday together with duty-free concessions on importation of chemicals, plants, machinery, and equipment.

Tonga

In Tonga, all basic construction materials such as timber, roofing iron, cement, gutting, and PVC pipes are duty-free while 3% duty is charged on capital items (Govt. of Tonga, 2014). Importation of certain goods is also duty-free.

The Cook Islands

The Cook Islands is establishing a private sector tax rebate for RE which is supported by donor funds.

Feed-in-tariff and net-metering

The UNDP/GEF report also identified FIT and risk-reduction as crucial for RE market development. PICs are implementing various mechanisms to attract private investment in the RE sector.

Fiji

Fiji is encouraging increasing participation of Independent Power Producers (IPP) and the Fiji Commerce Commission has increased IPP tariff rate to a minimum of FJD 0.3308/kWh.⁵ Stakeholder consultations are currently underway to finalize the Power Purchase Agreement modalities.

Cook Islands

Cook Islands has established a net-metering/gross-metering policy. For larger solar PV (up to 7 kW single phase or 21 kW three phase) integration into the grid, a FiT of 0.45 NZD plus VAT/kWh will be paid by utility to the customer selling electricity (CIN, 2013).⁶ People with small solar PV (up to 2 kW) are offered with the net-metering system while IPPs with 21 kW and above are dealt on a case by case basis.

Palau

In January 2012, Palau congress approved a law allowing consumers to feed excess

electricity from their RE systems to the grid and to be paid on a net metering basis. The law prohibits the utility from charging any excess fee for this activity.

Financing support

Fiji

In Fiji, with the aid of World Bank (WB), local banks are providing low interest loans for SE projects where the WB acts as the 50% guarantor. This sustainable energy financing project (SEFP) is to promote RE and energy efficiency equipment use in Fiji. Additionally, the Reserve Bank of Fiji has directed all commercial banks in Fiji to advance 2% of their deposits as loans for RE sector.

Tonga

Tongan government has launched a low-interest (1–4%) loan to help start businesses in priority areas such as agriculture, tourism, fisheries, manufacturing, construction and wholesale and retail trades through the Tonga Development Bank (Govt. of Tonga, 2014).

Palau

The National Development Bank of Palau (NDBP) provides a subsidy to new homeowners who employ energy efficient measures.

Energy planning and policies

The energy policy documents act as a guideline for the government departments and other stakeholders to work in a coordinated manner to achieve the goals and objectives set out in this document. Following is a description of the status of national energy policy development in the PICs:

Fiji

Fiji’s national energy policy aims to bring affordable and accessible SE to the people. Fiji is in the process of finalizing a new energy policy document that would replace the current policy formulated in 2006. In reviewing the energy policy, private and public sectors’ views on the current energy system and processes involved in setting up RE businesses were sought during public consultations. Fiji aims to achieve 81%

³These reports are available at <http://www.spc.int/edd/section-01/energy-overview>

⁴The PRDR was launched at the UNSIDS conference in Samoa (September 1–4, 2014).

⁵This is calculated on the basis of difference between the cost of thermal generation (0.46/kWh) and TDR (0.1267/kWh).

⁶The FIT of 0.45 NZD + VAT is much lower than what the utility charges for its diesel-generated power (0.75 NZD/kWh).

Box 1: Fiji Renewable Energy Power Project (FREP): facilitating investments

This GEF and Fiji government co-financed project aims at facilitating investments in the energy sector by addressing technical and information barriers. The other objective is to integrate renewable energy development into the national energy plan. The main activities include (i) development of national energy policy and regulatory frameworks, (ii) RE resource and RE project assessments, (iii) RE-based power generation demonstrations, and (iv) RE institutional strengthening including IPP and investment framework. A new draft energy policy has been prepared with the hope of achieving following SE4All targets:

Indicator	Baseline	Targets		
		2015	2020	2030
Access to modern energy services				
Percentage of population with electricity access	89% (2007)	90%	100%	100%
Percentage of population with primary reliance on wood fuels for cooking	20% (2004)	18%	12%	< 1%
Improving energy efficiency				
Energy intensity (consumption of imported fuel per unit of GDP in MJ/FJD)	2.89 (2011)	2.89 (0%)	2.86 (-1%)	2.73 (-5.5%)
Energy intensity (power consumption per unit of GDP in kWh/FJD)	0.23 (2011)	0.219 (-4.7%)	0.215 (-6.15%)	0.209 (-9.1%)
Share of renewable energy				
Renewable energy share in electricity generation	60% (2011)	67%	81%	100%
Renewable energy share in total energy consumption	13% (2011)	15%	18%	25%

Source: Fiji Department of Energy

of electricity generated from RE sources by 2020 and 100% by 2030. Currently, RE share in the total energy consumption is 15% (2011) and the new policy aims to increase this to 18% by 2020 and to 23% by 2030 (FDOE, 2013). In 2012, Fiji implemented Minimum Energy Performance Standards (MEPS) and Labeling Program for refrigerators and freezers, which is now being extended to other appliances.⁷ Fiji is also in the process of incorporating energy efficiency measures in its National Building Code.

Samoa

The Samoa National Energy Policy document proposes to increase the contribution of RE for energy services by 20% in the year 2030 (Govt. of Samoa, 2012).

Tonga

Tonga has developed a 10-year Energy Roadmap (2010–2020) where the underlying problems in the energy sector have been recognized and optimum and targeted solutions are identified (Govt of Tonga, 2010).

The Tonga Energy Road Map (TERM) puts the national government at the center of the energy planning with all the development partners/donors providing a cohesive support to national efforts.

The Cook Islands

National Energy Policy Document for the Cook Islands aims to “to facilitate reliable, safe, environmentally acceptable, and cost-effective SE services for the people of the Cook Islands.” The Cook Islands has a goal of 50% electricity provided by RE by 2015 and 100% by 2020. The Cook Islands have also adopted NZ/Australian MEPS.

Vanuatu

The Vanuatu National Energy Road Map has a target of providing electricity access to 100% of its population by 2030. It also aims to produce 65% of electricity using RE sources.

External aid for renewable energy development

External aid in PICs are either in cash or in-kind. The in-kind aid usually involves the

external partner/donor providing technical assistance and equipment for RE projects or energy efficiency projects. There are bilateral and multilateral agencies (JICA, KOICA, AusAID, NZAid, IRENA, GEF, UNDP, WB, SPREP, SPC, PIFs, etc.) which provide support to PICs for SE development. This support also includes capacity building of the PICs energy stakeholders such as utility staff, technicians, and decision-makers.

The New Zealand government and European Union co-organized a Pacific Energy Summit in March 2013 in Auckland. The PICTs presented 79 projects for possible funding and the summit was successful in raising NZD 635 million. A total of NZD 255 million was approved in grant funding and a further NZD 380 million in concessional loans sufficient to support over 40 of the 79 projects. The ADB has earmarked USD 270 million for SE projects in the Pacific for the period 2013–2015. This includes a USD 49 million co-financing grant. The EU has provided more than 100 million euro for

⁷The Fiji MEPS program is based on Australia and New Zealand Standards and labeling.

Box 2: Private sector in RE development

Sunergise: An example of private sector involvement in RE sector in the Pacific

Sunergise, a new entrant on the Pacific energy scene, calls itself a "Pan-Pacific solar power utility". They provide full service from design to installation and financing to maintenance of solar PV systems. The customers pay a fixed price for electricity and there are no up-front costs. These grid-connected systems are increasingly getting popular with local businesses and in the last 2 years, a number of systems have been installed including:

- 250 kW rooftop GCPV system for a poultry farm
- 125 kW rooftop GCPV system for a supermarket
- 77.5 kW GCPV system for a resort
- 163 kW GCPV system for a marina
- 600 kW off-grid PV system at an island resort (under construction)

The International Finance Corporation (IFC) has recently supported this innovative renewable energy business model by investing 2 million USD. Sunergise is expected to expand its services to other PICs soon.

Source: www.sunergisegroup.com

SE in the region and announced a further 25 million euro during the summit. Other major donors include Australia, Japan, UAE, and the World Bank. One of the projects commissioned under the energy summit partnerships is the new 2.2 MW solar PV system in Samoa.

Regional political support for sustainable energy

Regional leaders have unequivocally supported a move toward SE. Some of the recent declarations are given below:

The Denarau Communique

The Pacific regional energy and transport ministers held their second regional meeting in Denarau, Fiji between 2nd and 4th April 2014. The final meeting outcomes were spelled out in a statement termed the "Denarau Communique" with the following salient points related to SE:

- [the meeting] Acknowledged that 2014 marks the first year of the UN Decade of Sustainable Energy for All (SE4ALL) as well as the International Year of Small Island Developing States (SIDS), bringing the efforts to address issues relating to SE4ALL and SIDS even closer together, and re-affirmed the region's commitment to the vision of SE4ALL and to the achievement of its goals.
- Welcomed the inclusion of "sustainable energy for all" in the Pacific priorities to

be submitted to the SIDS conference,⁸ and called for the inclusion of "transport for sustainable development

- Welcomed the Pacific Regional Data Repository (PRDR) initiative and commended the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) for leading the initial work in this important area.
- Acknowledged the important role of and immense contribution by the private sector in the energy sector and encouraged more private sector involvement and investment in SE.
- Supported measures that increase efficiency and minimize losses in the supply side, and increase efficiency on the demand side.
- Supported review/analysis/modeling of electricity tariffs in each PICT.

The ministers called "energy a 'key enabler' of development, underscoring the importance of the nexus between sustainable energy and transport access, along with health, water, food and education." They stressed that access to SE and transport leads to poverty reduction and improved livelihoods in PICTs.

Barbados Declaration on Achieving SE4All in SIDS (May 2012)

At the conclusion of Ministers' conference on "Achieving Sustainable Energy for All

in SIDS – Challenges, Opportunities, Commitments" in Bridgetown, Barbados, the Ministers, and Heads of delegations "Emphasize(d) that achieving sustainable energy for all in SIDS includes providing all households with access to modern and affordable renewable energy services, while eradicating poverty, safeguarding the environment and providing new opportunities for sustainable development and economic growth."

The UN Conference on SIDS, Samoa (September 2014)

The UN conference on Small Island Developing States took place in Samoa from 1 to 4 September 2014. The outcome document called the "SIDS Accelerated Modalities of Action (S.A.M.O.A.) Pathway" recognized the role of SE and supported targeted measures to promote energy efficiency and foster RE. This would be done via integrating SIDS energy efforts with international energy markets, joint infrastructure development projects and investment in production and storage capacities.

The Small Islands Developing States Sustainable Energy Initiative (SIDS DOCK™)

This is a new initiative involving member countries of the Alliance of Small Island States (AOSIS) "to provide the SIDS with a

⁸ UNSIDS conference, Samoa, September 1–4, 2014.

collective institutional mechanism to assist them transform their national energy sectors into a catalyst for sustainable economic development and help generate financial resources to address adaptation to climate change." A number of member countries and development partners/donors signed the instrument for the establishment of SIDS DOCK™ during the conference in Samoa. SIDS DOCK™ has a goal of mobilizing USD 20 billion by 2033 to achieve its objective of increasing energy efficiency by 25%, generation of 50% of electricity using RE, and 25% decrease in the transport fuel consumption (2005 baseline).

The Austrian government and UNIDO are supporting SIDS DOCK in establishment of Renewable Energy and Energy Efficiency Centres in the Caribbean (CCREEE), Indian Ocean (IOCREEE), and the Pacific (PCREEE), and to provide support to the African islands at the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE).

Human capacity development

One of the most important requirements for the development and proliferation of SE is the availability of adequate human capacity at all levels — from technicians to energy sector planners/decision-makers.

According to 2014 REN21 Global Status Report, there are currently 6.5 million people employed in the RE sector (REN 21 GSR, 2014). An ILO report on skills and occupational needs in RE has identified a number of "difficult to fill RE occupations, ranging from wind/solar technicians to R&D engineers.

The Pacific region, like many other developing parts in the world, has its own share of failed RE projects (mainly off-grid solar) which could have been saved if there was basic technical capacity within the communities or an institutional structure was in place. The Sustainable Energy Association of Pacific Islands (SEIAPI) in collaboration with other partners has developed a competency standards and accreditation scheme for PV technicians in the Pacific. This scheme was formally launched in July 2012 during the Pacific rollout of the International Year of Sustainable Energy held at the University of the South Pacific (USP). A set of technical guidelines has been prepared to help harmonize existing stan-

dalone/grid-connected standards across the region.

USP in conjunction with Arizona State University has been running a vocational training program for off-grid PV technicians. This USAID funded program is run at two levels — Train the trainer (L2) for regional educators and technician level (L1) training at national level. Thirty trainers and about 200 technicians from 12 PICs have undergone this training. There are a myriad of other training initiatives trying to build regional capacity. Following is a sample of training workshops that have taken place in the past couple of years:

- Training of technicians in Federated States of Micronesia (FSM) — this was held in collaboration with the College of Micronesia.
- Training of technicians in Republic of the Marshall Islands — on solar home systems installation, operation, and maintenance (SPC).
- Demand side management in the North Pacific (SPC/PPA).
- Workshop on grid stability in Palau for the North Pacific countries (SPC/IRENA/PPA).
- Workshop on PV Technical Guidelines (PPA/SEAPI/IRENA).
- Workshop on Assessment of Grid stability for increased RE integration, Vanuatu, (PPA/IRENA).
- DSM and Supply Side Workshops (PPA).
- Operations and Maintenance-Distribution Workshop, Fiji, April 30–May 4, 2012.

At a recent workshop conducted by SPC and IRENA and attended by regional energy officers, following training needs were identified:

- Solar PV, wind projects cost benefit analysis;
- Grid stability, RE project analysis, and developing contract templates;
- FIT/Net metering and PPA arrangements;
- Software tools for project development, e.g., HOMER/RETScreen, etc.;
- Storage options;
- RE penetration and grid integration of various RETs;
- Data harmonization;
- Tariff study, regulatory guidelines;
- CBA for grid connected systems;

- Hybrid systems; and
- Data management and analysis.

An EU funded new project entitled "Pacific Technical and Vocational Education and Training on Sustainable Energy and Climate Change Adaptation (PACT-VET)" is currently being established. This project is one of the components of a larger undertaking named "Adapting to Climate Change and Sustainable Energy (ACSE) programme." The 6.1 million euro funding for PACTVET will help:

- Assess national training needs in SE and Climate Change Adaptation (CCA);
- Develop and implement benchmarks, competency standards, and courses on Training of Trainers (ToT) and create a pool of national trainers;
- Develop and establish training courses and support facilities within TVET institutions; and
- Strengthen networking in SE and CCA.

The project will be jointly implemented by SPC and USP over a period of 53 months.

Conclusion

In view of their unsustainable dependence on imported fuel, development of SE is not an option but a necessity for the PICs. The regional leadership and other stakeholders are actively working toward reducing their fuel bills by exploring suitable RETs and employing energy efficiency measures. It is imperative that appropriate human and technical capacity is available as higher percentage of RE is included in the energy mix for electricity generation. Private sector will play a very important role and enabling instruments should be in place to support IPPs. This article has mainly dealt with electricity sector but the PICs also have to seriously plan to cut fuel consumption by the transport sector. Only then they can reduce their vulnerability to ever-increasing petroleum prices and progress toward sustainable development.

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Multilingual Terminology Database

The World Intellectual Property Organization (WIPO) launched a new database providing free access to a wealth of multilingual scientific and technical terminology. Through its web-based interface, WIPO Pearl promotes accurate and consistent use of terms across different languages, and makes it easier to search and share scientific and technical knowledge. The database initially includes terms found in applications filed via WIPO's Patent Cooperation Treaty (PCT) and will eventually include collections from other areas of WIPO, such as trademarks, industrial designs, and terminology found in other treaties administered by WIPO. The 90,000+ terms and 15,000 concepts in 10 languages have all been entered and validated by WIPO-PCT language experts and terminologists, who have experience working with technical documents in multiple languages. Regular additions to the data are planned.

WIPO Pearl offers powerful search features, including the ability to select source and target languages, search by subject field as well as with abbreviations, and "fuzzy," "exact" and Boolean search functions. Users can obtain a quick list of results, which can be expanded, while browsing via "concept maps" that show linkages among related concepts by language and subject field - for example, showing concepts that are broader or narrower in scope than other concepts.

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