



# 3rd Pacific Energy Investors Forum

## Report and Forum Outcomes

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Institute





The Pacific Power Association (PPA) is a member of the Council of Regional Organisations in the Pacific (CROP) and represents 25 electric power utilities in 22 Pacific Island countries and territories. It was established to promote the cooperation of the Pacific island power utilities in technical training, exchange of information, sharing of senior management and engineering expertise, as well as other activities.

The Pacific Region Infrastructure Facility (PRIF) is a multi-development partner coordination, research and technical assistance facility which supports infrastructure development in the Pacific. PRIF Members include: Asian Development Bank (ADB), Australian Department of Foreign Affairs and Trade (DFAT), European Investment Bank (EIB), European Union (EU), Japan International Cooperation Agency (JICA), New Zealand Ministry of Foreign Affairs and Trade (NZMFAT) and the World Bank Group.

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## Executive Summary

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**This report includes the background material that was prepared to consider the private sector opportunities within the electricity sector across the Pacific together with the outcome of the Pacific Energy Investors Forum held in Palau on the 3rd of August 2018.**

The underlying work for the Initial report was commissioned by the PRIF on behalf of the Pacific Power Association (PPA) in preparation for the Pacific Energy Investors Forum on 3<sup>rd</sup> August 2018, an integral part of the PPA annual meeting held in Palau from 30<sup>th</sup> July to 3<sup>rd</sup> August 2018. The Forum was supported by the Pacific Centre for Renewable Energy and Energy Efficiency (PCREEE), the Global Green Growth Institute (GGGI) and the International Renewable Energy Agency (IRENA).

Information had been gathered through desk top studies, wide consultation with those active in this sector, country visits and meetings with many of the utility CEOs. Where possible, current data was included to provide relevant and hopefully useful information for those looking to understand the market and/or expand their activities.

The background report highlighted a number of opportunities:

- There is considerable activity in the electricity market across the Pacific region. Early donor supported developments are being expanded through Independent Power Producer (IPP) engagements. The number of such arrangements are still limited; but given the scale of renewables being planned across the region, to help eliminate dependence on diesel and to allow countries to meet their aggressive Nationally Determined Contributions (NDC) targets, the need for private sector involvement can only grow.
- The emergence of solar photovoltaic (PV) as a central solution across much of the Pacific is very apparent. While PNG, Solomon Islands and Fiji have good potential for hydro-electric developments, most other countries do not. Wind resources are mixed and large-scale biomass is limited in most countries. Wind and pumped storage are being considered in a number of settings to complement the growing need for energy storage, currently being addressed with various forms of battery.
- Financing remains a challenge and while there is finance available through multilateral sources, and to a lesser extent regional banks, the issue of guarantees is one that is being studied in some detail. While the markets remain relatively immature and the fiscal strength of small utilities is often questioned, IPP developers (and their funders) are reluctant to enter into 20-25 year Power Purchase Agreements (PPA) without security. As utilities gain more experience with IPP contracting and performance, there is evidence that sovereign guarantees are less available. This is a 'push back' by some utilities but also reflects the fact that sovereign guarantee liabilities impact national debt ceilings in countries that typically have limited financial resources of their own.

A selection of case studies was presented to highlight how the IPP approach is being addressed in various countries. The importance of proof of concept through donor support is apparent; the success of early IPPs builds confidence.

In addition, a more detailed overview of the status of renewables, the underlying electricity market, electrification levels, NDC targets, the state utility and current and future generation options are provided for Cook Islands, Fiji, Papua New Guinea, Samoa, Solomon Islands and Tonga.

In undertaking this study, the third of its kind since 2014, lessons learnt from earlier surveys and the presentation of potential investment opportunities have been important in shaping the current approach and in providing recommendations for similar future events.

The Forum was designed to allow opportunities for a brief presentation on the findings of the work underpinning this report, but more importantly, to allow discussions with those directly involved within the utilities as they work with the private sector to move their generation towards national renewable energy goals. The Forum was well attended and the panel approach allowed open discussion on generation planning, funding and financing, the successful structuring of IPP projects and the timing of upcoming proposals for these projects.

At the conclusion of the Forum, the following Press Release was issued:

## **MEDIA RELEASE**

**Pacific Renewable Energy market could require US\$500 million in investment by Independent Power Producers (IPPs) as solar PV and wind energy capacity is projected to double in the next 3-5 years.**

*Koror, Palau. 3 August 2018.*

A report released today by the Pacific Power Association (PPA) and the Pacific Region Infrastructure Facility (PRIF) indicates a growing opportunity for the private sector to invest in renewable energy facilities within the Pacific.

Electricity utility CEOs from the region, participating in an Investors Forum during the annual PPA Conference in Palau this week, clearly expressed their need for additional support of investments through the IPP market as they continue to reduce reliance on diesel generation and meet the national renewable generation commitments they have made under the Paris Agreement.

With some 15 IPP developments already in place, a similar number is anticipated in the next 3-5 years. The initial assessment of investment suggests that in excess of US\$500 million could be invested in the IPP wind and solar PV market alone, and it is anticipated a similar level will be spent by utilities in upgrading transmission and distribution networks, with storage capacity installed to cope with the intermittency of solar PV and wind generation. Beyond this, larger scale hydro-electric developments in PNG, Fiji and the Solomon Islands require an additional US\$1 billion of investment.

Renewable energy, particular solar PV installations, have become increasingly common across the Pacific. In just 5 years, programs supported by donor agencies have demonstrated the reliability of renewable resources and opened the door for an exciting market for private sector solar PV installations. While limited in scale, solar PV "farms" of 2-3MW in capacity are increasingly common, and the dramatic drop in the cost of solar power technology has allowed commercially viable grid connected projects. Under long term power purchase agreements (PPAs), investors offer generation facilities on a full turnkey basis, selling power to the national utility.



## Introduction

**This study was prepared under a technical assistance (TA) program supported by the Pacific Region Infrastructure Facility (PRIF).**

PRIF worked with the Pacific Power Association (PPA) as it prepared for its annual conference held in Palau, where the findings of this work were presented.

Dr Mike Allen, the consultant, focused on identifying and documenting the investment in renewable energy infrastructure as it has increased markedly in recent years in the region. All Pacific countries now have renewable energy targets and national power utilities are making significant investments in renewable energy infrastructure in order to:

- (i) reduce reliance on high cost diesel generation,
- (ii) improve energy security, and
- (iii) reduce greenhouse gas emissions.

Approximately 26% of all installed generation capacity in the Pacific is currently renewable energy based. Moreover, this proportion is expected to increase significantly in the short to medium term as power utilities implement capital infrastructure plans largely based on renewable energy.

Following an initial desk top study, and calls with a number of development partners and specialists involved in the region's energy sector, visits were made to Fiji, Tonga and Cook Islands, while information on a parallel visit to PNG was shared by an ADB team.

During the ADB's Asia Clean Energy Forum (ACEF) in Manila in early June 2018 the PPA facilitated meetings with other CEOs and managers from utilities across the Pacific that had not been visited in-country. The in-country visits and ACEF based discussions provided the opportunity to gain a first-hand understanding of progress in developing renewable resources in the region, the remaining challenges and the near-term expectations on additional investments. These meetings provided the basis for the case studies which are integrated within the report.

A number of opportunities to build on the 2014 and 2016 Investor Forums have been used to advantage and recommendations included will help strengthen the value and impact of future Forums.

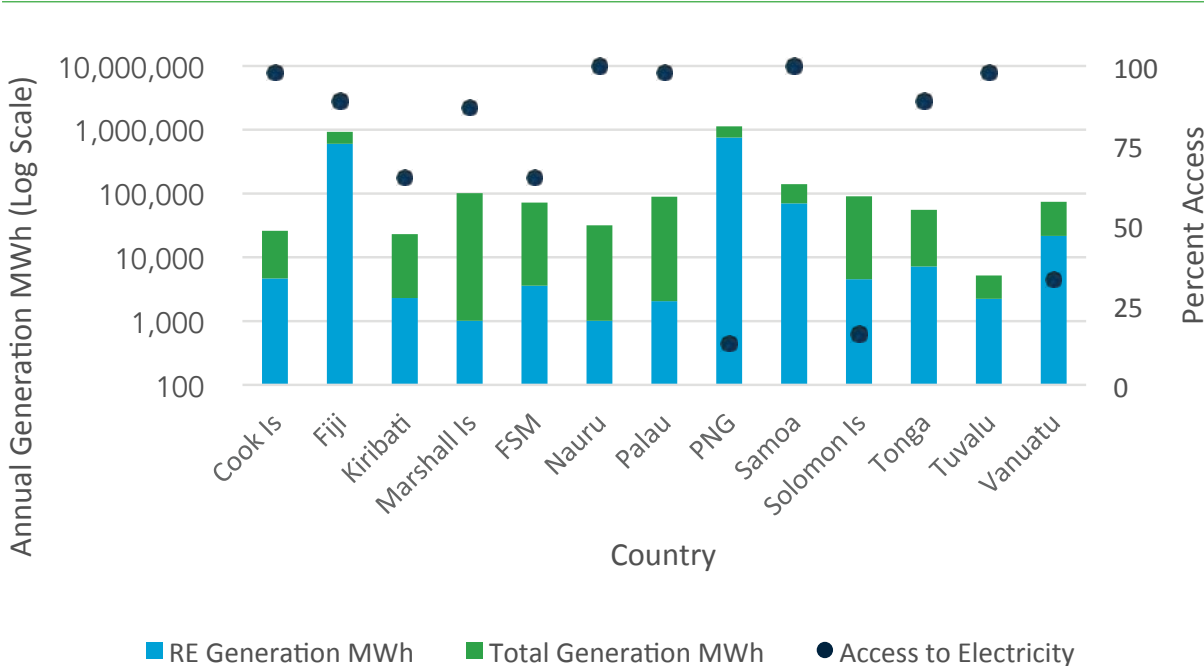


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## The Pacific Electricity Market

Amongst those unfamiliar with the Pacific there may be a perception that the region offers a homogeneous marketplace. While there are many social and cultural similarities across the small island nations that make up the majority of the countries in the region, their population, physical size, number of islands, political structure and economies display many differences.

Figure 1: Annual Electricity Generation and Access to Electricity



These differences clearly influence how each nation approaches the question of the delivery of secure and affordable electricity services. The long-term dependence on diesel generation, where the cost of fuel alone is typically at least US\$0.20-0.30 /kWh, has meant that the cost of electricity has remained high. In addition, often dispersed consumers who use a limited amount of power mean that the cost of transmission and distribution is a disproportionate part of tariffs.

One effect of this high cost diesel market construct is that, with the emergence of solar PV in particular, there can be immediate cost benefits in substituting diesel with solar power. There is a clear commitment to move to renewable energy with targets of 100% by 2025 not uncommon.

## Commitments to Renewables

The central instruments for implementing the Paris Agreement are the Nationally Determined Contributions (NDCs). These are climate action plans submitted by countries to the United Nations Framework Convention on Climate Change (UNFCCC) at COP 21.

All Pacific island countries submitted NDCs. They all include targets and implementation plans for achieving both mitigation and adaptation. The Pacific’s NDCs largely focus on reducing emissions in the energy sector, mostly by increasing renewable energy generation capacity and to a lesser extent actions on energy efficiency and green transport. The NDCs are therefore, both explicitly and implicitly, linked to the renewable energy targets that Pacific island countries have put forward. With the commitments that have been made through the country NDC targets, there is increasing pressure across the Pacific to move towards these goals. Although Pacific Island contributions to global greenhouse gas emissions are insignificant, a transition to a low carbon economy is crucial for overall sustainable development.

**Figure 2: Penetration of Renewable Energy and NDC Targets**

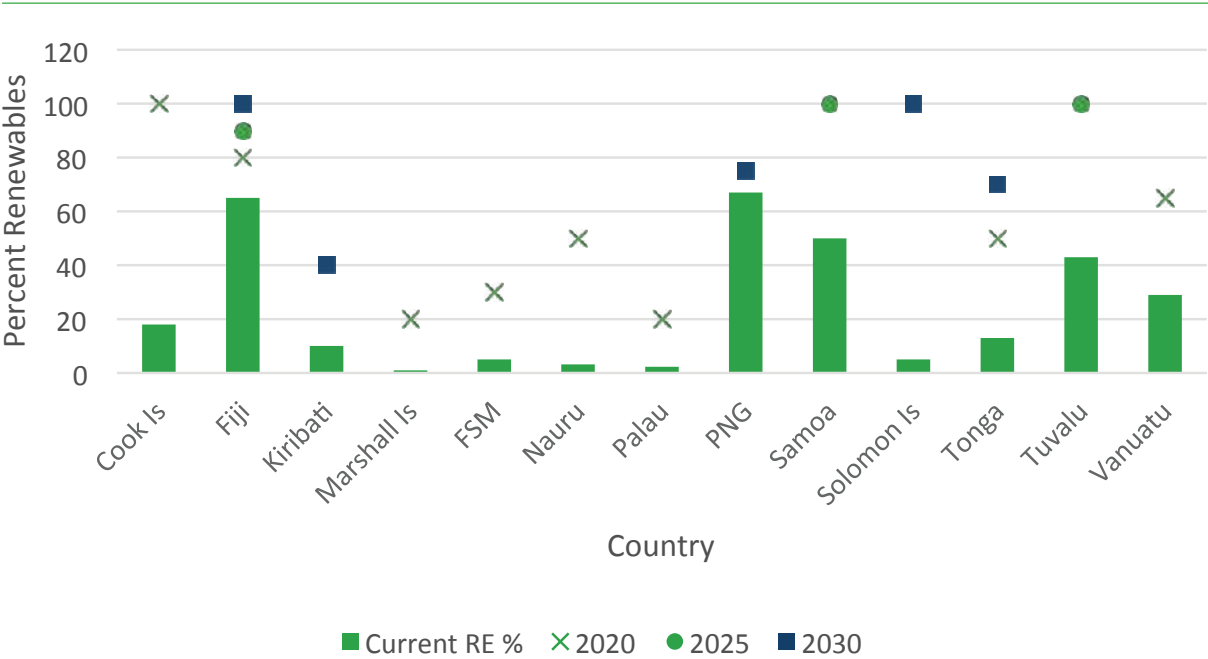


Figure 2 highlights the current situation across the Pacific. It illustrates the level of renewables that are already in place and indicates the targets that countries have under their NDCs.

While much of what is discussed in this report includes reference to examples from many of these Pacific nations, a focus on Cook Islands, Fiji, PNG, Samoa, Tonga and Solomon Islands reflects the local experience that these countries have had and the level of engagement that they have with the private sector and/or are contemplating. A number of case studies are drawn from this group as they provide valuable examples of approaches that have been effective in smaller and the largest markets in the region.

### The Nature of the Pacific Energy Markets

Many utilities, most of which are state owned entities, are receiving multilateral and bilateral support in power planning and to upgrade systems and operations and this is reflected in the progressive improvement in their commercial activities. However, the small scale of operations means many have limited capital resources. There is often a tension between allowing the utility an acceptable return on operations, in which the (variable) cost of diesel fuel is a key influence, and providing secure and affordable supplies of power in often challenging (isolated) locations.

Given the investment that is now required to install renewable generation facilities, utilities have been working with the private sector to develop IPP projects. In most countries, there is little experience in such an approach and limited engagement with the private sector in the electricity market. The utility's ability to borrow, and even to enter into a long-term power purchase agreement (PPA), is influenced by the risks (political and commercial) as perceived by funders; in addition, direct or contingent liabilities for loans or PPA obligations impact on the national debt ceiling, typically set at some 30-35% of GDP, competing with funding required for other national development priorities.

The current legal and regulatory frameworks for private sector participation vary across the Pacific; in some cases they are well established, in others they are nascent at this stage. For historical reasons, there is often an absence of strong institutions, effective regulation and effective policies; this can lead to a separation between the "energy office" and island utility's focus but it appears that in most cases there is a willingness to work to ensure that this environment is conducive to attracting credible private sector participation.



The *Stocktake of Energy Sector Institutions, Legislation, Policies and Fiscal Incentives in Fourteen Pacific Island Countries*, published by the Pacific Community<sup>1</sup> in 2016 provides a comprehensive and detailed background to these issues.

## The Recent Growth of Renewable Energy in the Pacific

In 2013 and again in 2016, regional summits in the Pacific addressed the need for early action on the transition from diesel dependency to renewables. The *Pacific Energy Country Profiles*<sup>2</sup> provided a thorough summary of the status at that time and anticipated future developments.

Since these summits, which saw substantial commitments for a range of familiar and newer contributors in the Pacific, there has been a significant acceleration in donor financed RE projects; a number of these have been mentioned elsewhere.

Though there may be some concerns about the possible tension between the roles that the public and private sector fill in a market, the small scale of the Pacific utility sector, and the often modest scale of centralised generation facilities in many countries, has seen what appears to be a successful and balanced sharing of opportunities.

The initial high cost of solar PV and some scepticism about its performance, as perceived by many markets even 5 years ago, has been progressively addressed through donor support for the first installations; these facilities have in general performed well and quickly provided reassurance to utilities and the public that this is a viable and reliable technology.

The rapid fall in the cost of solar PV installations that has occurred has also weakened early utility resistance, based on a reluctance to consider PV anticipating the rapid drop in costs that was being forecast. This transition is illustrated by the difference of some 80% in the cost of a 2012 solar PV array installed in Tonga and the reported cost for a similar facility completed in 2017.

## Case Studies

**The case studies included in this report describe a number of different approaches that have been used recently by utilities in Cook Islands, Fiji, Samoa and Tonga as they increase the share of renewable energy in their generation portfolios.**

The terms and conditions of the PPAs that are in place are not all publicly available but indications are that for the larger scale (>2 MW) solar PV installations there is strong competition in the market and very competitive prices are being offered.

The case studies outline the early influence of aid-based projects, particularly as they provide strong proof of concept examples in markets where such developments are still novel. The multi-year performance of these installations has boosted the confidence of the utilities and governments about their ability to rely on solar as a power source. Growth in the number of installations has, as noted earlier, driven the need for energy storage systems and these are now being installed to allow the next round of solar installations.

<sup>1</sup> <http://prdrse4all.spc.int/data/stocktake-energy-sector-institutions-legislation-policies-and-fiscal-incentives-fourteen>

<sup>2</sup> The Pacific Energy Country Profiles – NZMFAT 2016

## Rapid Expansion of Solar PV – Public and IPP

### A case study from Samoa

#### Renewable developments

Since 2013 Samoa has seen a rapid growth in its renewable based generation. Six donor funded projects provided a total of 3.1 MW of solar power and 550kw of wind power through support from the ADB, EU, NZAID, Japan PEC Fund and the United Arab Emirates (UAE).

#### IPP Projects

In what was seen as a leading position in the then nascent solar PV market, Samoa worked in parallel with the grant aid projects to engage the private sector to more than double renewable generation facilities in a programme that has seen some \$40 million invested by IPP developers.

While an early project was unsolicited, the remainder were tendered on the basis of an agreed annual generation – 3.5 Gwh per annum for a 2 MW array – under a PPA with EPC. No guarantees are provided for payment under the PPA. While pricing is not confirmed, it is believed to be some \$0.20/kWh for the Upolu based installations.

These Upolu IPP projects include three developments based at the airport:

- Green Power Samoa – 2 MW
- Sun Pacific Energy – 2 MW
- Solar for Samoa – 2.5 MW

and additional facilities alongside EPC installations at the racecourse:

- Green Power Samoa – 2 MW
- Solar for Samoa – 1.5 MW

with the Louis Berger 2 MW facility installed at Salelonga on Savai'i.

In early 2018, Sun Pacific Energy commissioned a 1.5 MW extension to their original airport facility; an offer from Green Power Samoa to add 2 MW to the grid was declined as EPC had concerns about the high level of intermittent generation that is now in their system. This is being addressed by the construction of energy storage facilities

#### Future IPP Opportunities

EPC has established the viability and attractiveness of IPP solar PV through an aggressive programme to attract private investment into the sector. The tendered process appears to have generated a reasonable level of competition and acceptable pricing. The unsolicited bid was agreed at a price that EPC is now challenging.

Once EPC has installed effective energy storage facilities to cope with the high level of intermittency from the existing solar farms, it anticipates issuing a number of new bids for further similar developments. Preparations for this process are underway and it is expected that there will be a call for offers later in 2018, early 2019.

## Opportunities for Private Sector Engagement in the Pacific

**It is clear that there is considerable activity across the Pacific within the electricity market.**

While growth in demand may be modest, the drive to ensure 100% access to electricity for all citizens is a central goal for many. Just as important is the move to displace current dependence on diesel powered generation with renewables as costs fall and the Pacific countries work to meet ambitious targets set under their NDCs. What is equally clear is that these national renewable energy targets cannot be achieved in a sustainable manner through grant aid alone. There is a recognition that the private sector needs to be empowered to play a central role in delivering these renewable resources.

As an example of the scale of activities, the ADB<sup>3</sup> noted that, with an existing portfolio of around US\$400m spread across 14 projects, it anticipated that there was a forward pipeline of some \$1.5 billion in 16 projects in 13 countries due to be initiated over the next 3 years. As part of this investment, activities continue on providing energy sector reform and capacity building that will enhance the market conditions to enable increasing private sector participation.

The nature and size of the Pacific economies mean that a portion of these energy sector developments will continue to be executed through the public sector. However, in itself, this will provide ongoing supply opportunities for services, equipment and materials. Independent private sector investment cannot be established in isolation and in a relatively immature market for renewables. Public sector projects have provided strong proof of concept in introducing newer technologies, demonstrating that they are credible, and commercially viable alternatives. This demonstration can only assist in reassuring investors and financiers that the Pacific energy sector is a market with a strong future.

3 ADB Pacific Energy Sector Overview and Proposed Pacific Renewable Energy Investment Facility - 2017



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## Biomass and Solar PV IPPs

### A case study from Fiji

#### Nabou Green Biomass Project

While there have been biomass projects over a number of years in Fiji, associated with the sugar industry and timber industry, the Nabou Green project is the first major independent IPP project.

Nabou Green Energy Limited is comprised of four key stakeholders; GIMCO, GS Power, Mirae Asset Daewoo and Tropik Fiji Ltd operating a 12MW biomass plant. The US\$45 million plant has been constructed in Nabou, Sigatoka with official opening in late July 2017.

Following informal discussions with Fijian officials in 2012, GIMCO moved to Fiji, explored the viability for a biomass plant and with the support of government and Fiji Electricity, signed a Power Purchase Agreement (PPA) for 25 years. Given the stature of such a project and being one of the first in Fiji and the South Pacific, it was anticipated that it would be challenging to attract local investors as it was very difficult to predict accurately if the project will be successful and deliver adequate returns for investors. The lone local owned and operated entity, Tropik (Fiji) Ltd, provided 5000 hectares of land for the construction and growing of the feedstock for the proposed biomass plant. With all the uncertainty and risks, GIMCO decided to obtain funding from Korea provided by GS Power and Mirae Asset Daewoo.

The construction of the plant began in April 2015 and was successfully completed in July 2017. The unique feature of this plant is its ability to use the widely available, fast growing, energy

dense *Gliricidia Sepium* as a feedstock for the boiler. Wood residues from sawmills and logging industries will also be used. The plant also utilises African Tulip which has been classified as an invasive species by the Department of Forestry. African Tulips are known to grow quickly and displace native vegetation and invade natural ecosystems. Using African Tulip as a feedstock will help the Government in its eradication efforts.

#### Solar PV Developments

During a period when there were clear indications that the costs of solar PV panels were dropping rapidly, EFL was reluctant to enter into long-term, fixed tariff, PPA agreements for solar power. There was also a mandated FIT set at a level that EFL was reluctant to consider. This FIT structure is no longer in place. With the change in tariff regime and as the PV panel pricing reached all time low levels, EFL sought expressions of interest from the private sector to deliver a first 5 MW installation.

With an indication of market pricing, EFL is entering into a joint venture agreement with local company Sunergise. Under this agreement Viti RE Limited has been formed in which EFL holds a 51% interest and Sunergise 49%. Viti RE will enter into a 25 year PPA with EFL. This project is proceeding.

EFL have indicated that they are looking at a potential 4 additional 5 MW solar PV facilities. It is unclear whether these would also be established under some JV arrangement or on a more traditional IPP basis.

## Technology Choices and Market Drivers

**As already noted, the falling price of solar PV has provided a significant advantage as efforts focus on substituting for diesel generation.**

Where existing diesel facilities are old or inefficient, replacement or upgrades are being supported by donors, often as part of a hybrid transition from all diesel to a combination with wind or solar PV. A number of donor funded solar PV projects can be seen across many of the islands in the Pacific, with a surge in activity over the last 5 years. While the potential for orthodox hydro generation is limited in many of the islands, the use of pumped storage is being investigated. In Papua New Guinea, Solomon Islands and Fiji, hydro-electricity is seen as a real option in the renewable energy mix.

This impact of the rapid increase in intermittent generation is now apparent as utilities are reaching a point where additional intermittent generation cannot be accommodated in their main grid. To address this situation, there is a current focus on the installation of battery facilities, both for storage, to better balance peak demand and time of generation, and to provide a level of grid stability. It is suggested that some 30MW-hours of energy storage facilities are likely to be installed in the next 2-3 years.

As with concerns during early solar PV installations, there is some hesitancy about the current cost of storage and committing to batteries when their costs are anticipated to fall. Until the costs of storage facilities do drop, there may be limited commercially viable private sector investments in such facilities; this is reflected in the fact that a number of utilities are seeking specific grant finance for energy storage systems, in particular through the Green Climate Fund (GCF). The opportunities for wind power have seen limited development in the Pacific, but again there are plans for installations, albeit small in capacity, where these can help offset the need for storage. It is understood that JICA is supporting Tonga in the construction of a 5 x 275kW wind installation, expected to be on line in 2019.

Though both wind power and pumped storage are not always cheap options, their longevity, and the fact that the current cost of installing batteries is a similar cost to diesel generation, is seeing them given serious consideration. One point of debate around wind generation is the obvious risk that turbine installations may be exposed to during cyclones.

The use of biomass as a source for power generation has only occurred at any scale in Fiji. This grew from the presence of the sugar industry and later wood processing working with state owned entities to take excess power or seasonal generation; only recently has an independent biomass unit been constructed by an IPP entity. While geothermal resources have been identified in a limited number of islands, the exploration risks and costs are heightened by the small scale of developments that have been considered. Publicly funded investigations continue in Vanuatu and Fiji but no near-term generation projects seem likely.

As in any energy market, there will be a continuing need for fossil fuelled generation until alternatives are in place and/or as backup where adequate storage is not available. As noted, a number of programmes are looking at improved diesel efficiency as part of hybrid developments.

In some islands, such as Nauru, a fundamental upgrade of the basic power generation equipment has been required to regain market support; here the immediate effect is one of reduction of central grid and captive generation diesel consumption with obvious national benefits. The next step is to consider the introduction of renewables beginning with a recently announced 1.1MW solar PV installation to be installed with support from NZMFAT. In the FSM a combination of upgrades in diesel efficiency will parallel the increased dependence on renewable resources.

In Vanuatu coconut oil has been blended with diesel to reduce diesel consumption in existing generation plants and others are considering this option. Unfortunately, the viability of such initiatives is strongly influenced by the market price for coconut oil, which of late has increased appreciably.



## Public Sector Projects attract IPP engagement in Solar PV

### A case study from Tonga

#### Maama Mai Solar PV Project

In 2012 the Maama Mai 1.3 MW solar PV project was commissioned by Tonga Power Ltd (TPL). Though originally conceived in 2009 as an IPP opportunity, the project financing was restructured in 2011 with an alliance that saw:

- NZAID - provide full project funding of NZ\$ 7.9 million, on a grant basis
- Meridian Energy - developer, legal owner, operator and maintenance (O&M) for a period of 5 years
- TPL - long term owner and O&M, taking over ownership in 2017

It is understood that the facility has delivered secure and reliable power since commissioning, providing a strong proof of concept from this first large scale solar PV development in Tonga.

#### Vaini

Tonga's Vaini solar PV facility, provided by the Government of Japan through JICA was commissioned in Tongatapu in May 2015. It was the first photovoltaic solar facility to introduce a stabilising capacitor and micro-grid control system. The 1 MW solar facility came with two sets of 500kW stabilising lithium ion capacitor banks which offer very quick reaction to solar PV troughs caused by passing clouds. Again the performance of this facility has reinforced the positive view of solar PV as a reliable and secure source of power for Tonga.

#### Singyes IPP

Based on the success of these two initial solar farms, TPL issued a tender to secure an additional 2 MW of capacity, but this time on an IPP basis. The project went into full operation in late 2017. The IPP is being managed under a 25 years PPA, without any guarantee, with TPL and pricing is understood to be some US\$0.15/kWh. The PPA has been drawn up under New Zealand law and dispute resolution in through

arbitration in Singapore. Singyes equity financed the initial installation but, with a year of satisfactory operation completed, is reportedly looking to refinance the project through a private bank. TPL is understood to have negotiated a small equity share in the project (in recognition of in kind contribution of technical studies, land access, interconnection, etc) and to have an option to increase its shareholding in future.

#### Future IPP Opportunities

TPL issued a further call for tenders to provide 6 MW of additional solar PV generation in early 2018 and this bid is still under evaluation. In a further grant based development, the Japanese Government has committed to build a 1.3 MW (5 x 275kW turbine) wind installation at Niutoua under a US\$20 million grant agreement. This project is expected to lead to future IPP wind opportunities. It is understood that the Chinese Government is also likely to offer a wind installation in the near future.

With the current level of intermittent power, the Tonga Renewable Energy Project (TREP) proposal was officially submitted to the Green Climate Fund Board this year. The proposal includes all of TPL's energy storage needs in Tongatapu, 10.1 MW / 19.9 MWh Battery Energy Storage System (BESS) capacity and 650kW solar generation with 1.4 MWh BESS split between 'Eua and Vava'u. The BESS in Tongatapu will allow an increase in renewable energy generation by about 7.8 MW (4 MW solar PV and 3.8 MW wind power). This will enable Tonga to increase their renewable energy penetration by 24% without negatively affecting the grid. It is anticipated that the GCF projects and the recently commissioned PV installation plus additional IPP plants to be installed in future, will push Tonga Power towards achieving this target by 2020.

## Financing Renewables

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**It is commonly quoted that although renewables offer low long-term costs they require a higher upfront investment than fossil alternatives.**

This higher initial cost can be a challenge to finance and, despite the relatively rapid deployment of solar PV in the Pacific, banks remain reluctant to finance private sector projects. There are clearly exceptions to this, but generally some form of guarantee is sought by the funder and this in turn means the IPP will look for security from the utility / national government to offset political risks and the risk of non-payment under the PPA.

One of the benefits of the fairly high level of donor activity in the regional solar PV market has been that there are now clear “proof of concept” solar operations in the market. This local experience is helping attract the interest of regional banks, but they are still more inclined to consider re-financing of larger scale installations, after there is a year or two of operational history. This inevitably means that equity funding is needed for the IPP; in turn this tends to favour the larger companies with a stronger balance sheet. While these companies may be better matched to the funding needs of the market, they may also be less interested in the typical 2-3 MW solar PV installations that are being contemplated. Local interests may have the technical and management skills to undertake an IPP but lack the necessary equity.

Within the region, all the multilateral banks are active. Traditional public-sector lending requires sovereign guarantees. With the public-sector funding being underwritten by such securities, it is a challenge to get private sector finance from these sources without some form of guarantee. The appetite for risk through the private sector arm of the institutions is tempered by concerns about political risk and the strength / capacity of the utility balance sheet.

There are regional risk sharing models designed to see collaboration between the MFIs and private banks, but these have not been fully tested. Where any of these arrangements require full or partial recourse to sovereign securities, there is the potential impact on national debt, as noted earlier.

A regional development bank guarantee facility is under consideration; this is conceived as a mechanism to allow guarantees for political and PPA non-payment risks to be covered through a donor sourced reserve pool, without the need for any recourse to sovereign guarantees. This facility could be of significant value but has yet to be formally accepted as an option.

Discussions with local banks suggest that an effective guarantee facility could allow them to consider reducing the cost of capital and potentially offering longer tenures; this could assist in lowering the cost per kilowatt from the IPP, in turn providing reduced costs for the utility and end users.

A new Frontier Fund has been proposed by Australian based interests and is a private facility that is looking to access GCF funds that can be blended with more commercial investment raised from the private sector. This is in an early establishment phase.



## A Distributed IPP Solution

### A case study from Cook Islands

#### Background

With a diesel-based generation system, for which fuel alone costs at least US\$0.20 / kWh and current retail tariffs are some US\$0.52/kWh, the opportunity to introduce solar PV was very appealing. Donor support had allowed the installation of 1 MW at the airport but there is limited state-owned land on the island and even fewer large areas of private land that could be accessed for further installations.

#### Solution

With land access an issue – often due to difficulties in resolving the question of ownership by multiple parties – TAU developed a scheme that provides a power purchase agreement with residential (consumer) land owners and commercial property holders. Under this a feed-in-tariff of NZ\$0.45/kWh is guaranteed for a 5 year period and a tariff set at 49% of the average retail price is then assured for a further 5 year term. Systems from 21kW through to 100kW in capacity have been installed; where funding has been required, typical mortgage financing facilities have been provided by the Cook Island Development Bank, BSP and ANZ. Security is taken over the supplier's land and income from the first 5 year period is generally sufficient to pay off the full cost of the solar installation.

#### Benefits

- TAU has access to an additional 1MW of distributed solar PV generation
- Land ownership issues have been simply addressed
- There are benefits in reduced distribution requirements from the distributed generation located close to consumers
- From year 6 on the consumer sees a saving of 51% of their unit cost for electricity
- The scheme has strong popular support

#### Opportunities

While the distributed small scale IPP approach caters for individual consumers to participate, there may be an opportunity for commercial entities to enter this gross metering arrangement. TAU is reluctant to see large off grid generation that would effectively seriously reduce the utilities demand. TAU anticipates that it will extend the current model, once adequate BESS is installed.

## IPP Engagement in the Pacific

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### **While there is limited experience with IPPs in the renewable sector in the Pacific, there are some generic PPA templates available.**

As would be expected, detailed PPA contracts are commercially sensitive and pricing is not widely known. In some markets bilateral support has been provided to help draft the PPA and this has assisted in reaching mutually acceptable agreements.

PNG has a history of IPP developments, many associated with mining activities, and a large number of potential opportunities for hydro-electric resources.

In Solomon Islands there have been long-term efforts to engage the private sector in the Tina River hydro project; this installation could meet a substantial portion of Honiara's demand. The novelty of private sector participation when the project was first envisaged and the perceived risks, technical, land access and commercial, around the venture has seen progressive restructuring of the development. It is now being finally negotiated as a BOOT model operating under a 30 year concession and a PPA with Solomons Power. Financing has been a challenge and the final arrangements are a combination of grant and soft loan facilities to allow the engagement of an appropriate project developer.

In Cook Islands the utility (TAU) has a 5+5year PPA in place with a large number of small scale (domestic and commercial) suppliers; this offers a NZ\$0.45/kWh (US\$0.32/kWh) rate for 5 years and a tariff equivalent to 49% of the then-applicable-average-retail-tariff for the second 5-year period.

For commercial scale installations of 2-3MW in capacity, tariffs of less than US\$0.20/kWh are understood to be in place with some below US\$0.15/kWh.

The challenge for IPPs entering the Pacific market is the typically smaller scale of developments that are being bid out – the hydro electric opportunities in Papua New Guinea are clearly much larger developments. The viability of undertaking construction and installation in a remote island location where logistics are difficult, and then maintaining a local presence for O&M throughout the duration of the PPA may not be easy; equally national governments have questioned whether in fact all IPPs would be willing (and able) to maintain a presence throughout the term of the contract.

In discussion with one of the utilities that has successfully negotiated a recent PPA with an international IPP, they offered what appears to be a very practical approach. Given the utility's in-house capabilities and access to local contractors, the utility is proposing that for future developments they would be prepared to act in an EPC role for project execution. In addition, as applies for current projects, the utility would offer an O&M service post commissioning. While this approach might not reflect an orthodox IPP structure, it may well offer a pragmatic option for an island situation in the Pacific.

In Fiji the utility (EFL) has established a joint venture relationship with a local developer under which the JV will enter into a PPA agreement with EFL.

The small scale and remote environment in which IPPs are being considered in the Pacific may well require some innovative solutions to allow the market to expand in a mutually beneficial manner.





*PPA Annual Conference 2018 group photo.*

### **The Pacific Energy Investors Forum held in Palau in August 2018 was the third supported by the PPA.**

In preparing the background report and gathering background data and information, a number of points have been highlighted. The Forum itself provided an opportunity to debate some of the issues that have been identified so that a coherent, collective set of recommendations could be presented. The summary notes and recommendations that follow draw on the discussions within the Forum and during the wider PPA annual conference in Palau.



# Summary Notes and Recommendations

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## The Forum

The Forum was held on the final day of Pacific Power Association's 27<sup>th</sup> annual conference. It was the third such event after those in 2014 and 2016. Although the tradeshow, organised for Affiliate members, and PPA technical sessions closed on the 2<sup>nd</sup> of August an estimated 70-80 attendees joined the Forum on the 3<sup>rd</sup>, reflecting a strong interest amongst the participants.

The day opened with a presentation of the report *Exploring the Private Sector Opportunities in the Pacific Energy Markets*, prepared by Dr Mike Allen under contract with the PRIF. The report and PPT presentation have been provided separately. The Agenda for the Forum is attached to these notes.

## Forum Discussions

Following the opening presentation of the report by Mike Allen, the day continued with four panels as outlined in the attached agenda (see *Appendix – Forum Agenda and Panels*).

### Panel #1: A Utility view of the electricity market

Through contributions from utility CEOs, who have had first-hand experience in IPP activities, the audience was provided with a candid overview of early attempts to engage the private sector, some of the pitfalls that occurred and the recent, positive progress that has been made. Each of the CEOs had different experiences to share covering solar PV, biomass and hydro-electric opportunities. There were a number of key messages:

- The financial and technical capabilities of IPP developers should be carefully evaluated; such developments are new in the region and still limited in numbers.
- Look carefully at what is being offered and ensure it is appropriate and achievable.
- Pricing is not directly related to existing tariffs; it should reflect actual costs for the IPP and a realistic rate of return and offer a win-win for those on both sides of the agreement.
- The power purchase agreement must be well structured; there are good examples in the market now and these could be shared.
- There is a high level of interest in the solar PV market so competition is growing and pricing should reflect this.
- Biomass projects are exposed to risks around feedstock supply and these should not be underestimated.
- Land acquisition is critical for hydro (and all developments) and securing tenure can be a significant and time-consuming hurdle – this is generally the responsibility of the state / utility, not the IPP.
- Despite all the challenges, the CEOs acknowledged that IPP developments are an essential part of their future, given the significant investments that are required. Each also noted that recent agreements have been much more acceptable to all parties.

### Panel #2: A market view of opportunities

This session saw input from a local solar PV supplier / EPC contractor, the developer of most recently completed solar PV project in the region, a specialist in storage and project supplies and a multilateral bank. Discussions were enhanced by the fact that the EPC contractor is also a current member of a utility board and the specialist in storage has prior experience as CEO of a Pacific utility.

Points that were highlighted included:

- For the IPP developers the scale of projects is small, in comparison to developments elsewhere. However, experience had shown that there were a number of complexities that had not been anticipated and these had caused some delays in implementation, despite best efforts to plan around these in advance.

- It is critical that the IPP and utility have a strong and close working relationship; the utility has considerable local knowledge that can help identify qualified local contractors / support and assist the IPP address local limitations around skills and logistics. The impact of local weather (rainy season) should not be underestimated.
- The issue of land acquisition is clear. The importance of transparency around utility costs is important to build credible relationships between the utility and the developer. Access to a competent, independent regulator is of increasing importance.
- IPP developers do look for some form of guarantee for payment, given the duration of the PPA agreements and the small (financial) size of most utilities; it is recognised that sovereign recourse creates challenges for the country debt ceilings
- As with any business, IPP developers are looking to establish a track record and hopefully build some scale in the market. Future pricing will be improved (at least in the near term) by a continuing drop in the price of solar PV panels in the Chinese market.
- While the capacity of local EPC contractors and sub-contractors may be limited it is building and some markets are seeing positive growth and competition in this sector. This should be supported and encouraged as it can only help drive down future costs.
- Multilateral bank activities are seen as valuable to build first-of-a-kind installations in markets, with the intent that these will attract private sector IPP interests for subsequent stages. Early support for (solar PV) generation is now being followed with funding for storage, which remains expensive. Isolated mini-grid developments may also be financially challenging, but there are private groups now willing to consider multiple development opportunities.

### Panel #3: Market influences and support mechanisms

This panel provided contributions from an international energy agency, a regional centre for renewables and energy efficiency, a specialist international project facilitation organisation and a bilateral agency. This combination provided regional and international experiences to be shared and compared.

Discussions covered:

- Bilateral support can cover a range of inputs from energy plan preparation, policy and regulatory development, funding for proof of concept and the dissemination of lessons learning. There is also scope to help build private sector engagement by support for feasibility studies, legal advice, tender preparation and issue, commercial negotiations and transaction advice. In some cases, there may be the potential to underwrite blended financing where projects may be marginally viable but important as proof of concept or have particular development value.
- The regional centre is part of a global UNIDO group and a such can bring international experience to the table. The policy and regulatory situation in-country is key to effective attraction and engagement with the private sector and this has been reviewed and is now well documented. The centre promotes a range of training activities for those in the region and the needs are being constantly reviewed.
- With the current focus around the Paris Accord and climate change there is a perhaps unique window for the Pacific to access funding for renewable energy expansion across the region.
- IRENA has developed a suite of support mechanisms to assist in growing the renewables market. These include the Global Atlas, Project Navigator and the Renewable Energy Marketplace, all of which are web based. In addition, the IRENA/ADFD Facility can provide financing of up to some \$15 million per project (not exceeding 50% of total investment) but this does require a sovereign guarantee.
- PFAN is looking to enter the Pacific market and is currently assessing the opportunities and its strategy in the region. The facility looks to draw on local professional resources, on a pro-bono basis, to help project and SME entities to develop bankable business plans and secure funding. It has helped secure some \$1.3 billion in project finance globally for such entities.

#### Panel #4: Maximising the collective benefits of experience to date

The session moderator challenged the panel, a legal specialist, PPA executive director, utility CEO and regional bank representative, to consider investment/innovation and integration themes as they had been addressed during the discussions during the PPA conference and the investor forum.

It was highlighted that:

- Recent power purchase agreements (PPA) developed for solar PV and hydro-electric projects in the region has seen the establishment of a “light” approach to the PPA, most suited to solar PV, alongside a more traditional “bankable” PPA for projects with significant investment. While a solar PV IPP facility will be secured through a long term PPA, the financial exposure is modest and may be funded, at least initially, through the developer’s equity sources. Where a larger scale hydro-electric project is project financed, funding sources will seek a higher standard of security that will inevitably require multilateral and/or sovereign guarantee provisions.
- The development of these two approaches now provides the market with sound templates for future IPP engagements.
- From a utility perspective it was stressed that the PPA should reflect a realistic – and win-win – solution around the question of capacity / energy payments and the basis for the establishment of appropriate pricing. The payment for capacity in a hydro scheme was questioned; low year capacity and generation levels above that guaranteed under a PPA needed to be reconciled.
- The solar PV IPP market had earlier struggled to gain traction when it was clear that costs were dropping dramatically; in turn this made it difficult to reach mutually acceptable long-term tariff agreements under any PPA. This was now less of an issue.
- From a regional banking perspective, it is anticipated that, while there will be a growth in the number of IPP projects being implemented in the next 2-3 years, this may plateau. There are some 18 to 20 additional projects, with an investment of \$1.2 billion, likely in this period.
- There are demands for TA and support for transmission, substation and distribution upgrades and expansions that will require the public sector to make investments that are unlikely to be transferred to the private sector.
- It is seen that there is a market need for guarantee facilities. The question of sovereign recourse is recognised but underwriting utility creditworthiness, ensuring project bankability, addressing perceived commercial and political risks and securing long term payment obligations suggests guarantees are required. A model that would be donor backed, rather than through a multilateral or regional financial institution, is under consideration. While there are existing multilateral guarantees available in the Pacific, these all require sovereign recourse and this has an unacceptable impact on the national debt, restricting borrowing for non-energy activities.
- The role of the Pacific Power Association is of growing importance. As the (renewables) market grows there is an opportunity for increasingly pro-active involvement. The value of sharing information is clear and has been highlighted through the discussions at the Forum. Frank and open disclosure of successes and failures amongst members is of real value.
- There are opportunities for the PPA to engage with governments around sector reform and energy related legislation.
- With the growth in demand, the transition from diesel to renewables and emerging new technologies there is a key role to play in capacity building and training for utilities.

## Recommendations

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**With the background of the Report presented at the Forum, interaction with PPA members before and during their annual conference and the output from the four panels during the Forum, there are a number of recommendations for consideration by the PPA.**

### PPA Activities

There is a growing value in PPA facilitating the sharing of the knowledge from across its members; the engagement with the IPP sector is new and offers fresh challenges and members can assist each other around the structuring of agreements, pricing and attraction of credible and reliable IPP developers.

While some of the IPP / PPA agreements may be commercially sensitive, there is perhaps room for some of the more specific details to be shared at a CEO level? Discussions during the Investor Forum indicated that the pricing (even a range) that has been negotiated recently is of real value to others.

At a general procurement level, the opportunity to share actual contracted costs for supply of equipment and materials may be of value in keeping suppliers honest and helping reduce costs across the region. This is a common practice amongst large scale gas generators for example in parts of Asia and elsewhere, even where they may be competing utilities in the same market; there are benefits to all in that market.

Coordination of training for member utilities would seem a natural opportunity for the PPA. Different donors run a mix of courses and training programmes and there is a continuing tension about training overseas, at a regional centre or in-country. The latter has a great deal of appeal in that it allows technical training on the actual equipment that trainees will operate. There is quite a lot of work to be done in rationalising the training and there is no obvious (appropriate) leadership for this in the region.

### The Energy Investor Forum

The Investor Forum has traditionally been held alongside every second annual PPA conference. The intention of the report prepared ahead of the Forum has largely been to present IPP opportunities (to investors); this has not always been easy, firstly to collect accurate data and secondly to be able to present opportunities that are current. As the market matures and there is an increase in the number of interested parties, the focus of the Forum may need some adjustment.

On the basis that the IPP opportunities continue to grow and that there is a need to draw more players into the market, it is suggested that the Forum might be more effective if it were held in Sydney or potentially alongside the ACEF hosted by the ADB in Manila. This needs further discussion but PPA has indicated that this has some appeal and ADB have suggested that they would consider support for either option.

The potential growth in the IPP market could suggest that the Forum be held annually, and if not linked to the PPA conference its timing could be flexible. An annual, or even half yearly, update on project opportunities could be beneficial; the latest report preparation has shown that this is not straightforward but there is perhaps a level of momentum from the efforts in 2018 that can be capitalised on to see if data can be collected more regularly going forward. It is unlikely that this will occur without a proactive engagement with utilities.

## Featured Countries and IPP Opportunities

The notes above provide background to the current market conditions in the Pacific and, for the smaller of the island nations, highlight the need for near term solutions to allow the addition of more solar PV generation in particular.

**In the Featured Countries that follow an attempt has been made to provide background on a sample number of countries, their political and economic environment with an overview of the electricity sector and the national utility, its operations and future plans for generation, focusing on renewables for expansion or substitution for current fossil fuels. A list of existing and anticipated IPP developments is provided and these should form the basis for enquiries by those interested in specific markets.**

Where the focus is on solar PV, there are plans for expansion in most systems. The rate of this expansion is often now being dictated by when utilities will have adequate storage capacity in their systems to accept additional intermittent generation. Experience from Cook Islands, Samoa and Tonga provides illustrations of relatively rapid expansion of grid connected solar PV.

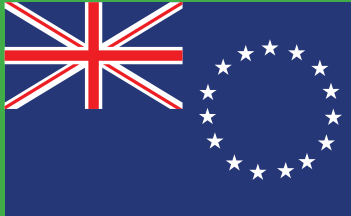
Fiji has both hydro-electric and biomass potential and there is more recent consideration of grid connected solar IP opportunities.

In Papua New Guinea, the focus is on larger scale hydro-electric opportunities in the near term, but the utility is not seeking to negotiate on these projects immediately as it is undergoing a review of generation requirements that will clarify where their focus will be going forward. PNG is clearly the largest market by far; it also has significant challenges to deliver universal access to electricity.

In Solomon Islands, where the IPP focus has been on the Tina River hydro for many years, development is now concentrated on isolated (hybrid) mini-grids, a market yet to be tested with the private sector. There is an interest in exploring IPP involvement, but this may require some updating of existing legislation.



## Cook Islands

<b>Population</b>	17,500	
<b>Access to Electricity</b>	98%	
<b>Installed Capacity</b>	15 MW	
<b>Annual Generation</b>	26 GWh	
<b>Renewables Target</b>	100% by 2020	
<b>Current RE Production</b>	18% (2017)	
<b>Additional RE to reach target</b>	11MW of solar PV, 2MW of wind and 2MW of hydro pumped storage	
<b>Potential Investment</b>	\$50 million	

### Cook Islands Existing and Potential Projects

Project	Location	Island	Technology	Short description	Capacity (MW)	Year
<b>Projected Pipeline and Proposals</b>						
Rarotonga Grid Tied Solar Extension	Distributed	Rarotonga	Solar PV	A continuation of smaller scale solar PV	11MW	2018
Wind		Rarotonga	Wind	Exploring wind to supplement need for storage	2MW	N/A
Pumped Storage		Rarotonga	Hydro Storage	Pumped storage as longer term option	2MW	N/A
<b>Existing TAU RE Facilities</b>						
Airport solar project	Airport	Rarotonga	Solar PV	Solar PV installation on airport buildings	960 kW	2015
Airport solar project	Airport	Rarotonga	Solar PV	Additional solar PV at airport	1.3 MW	2018
<b>Existing IPP Facilities</b>						
Rarotonga Grid Tied Solar	Distributed	Rarotonga	Solar PV	Distributed small scale solar PV - 21kW to 100kW	3.3 MW	2016-17

### The Country

The Cook Islands is a self-governing island country in the South Pacific Ocean in free association with New Zealand. It comprises 15 islands whose total land area is 240 square kilometres. The Cook Islands' Exclusive Economic Zone (EEZ) covers 1,800,000 square kilometres of ocean.

With a population of some 17,500 (2018 estimate) the Cook Islands' main population

centres are on the island of Rarotonga where there is an international airport. There is a larger population of Cook Islanders in New Zealand itself; in the 2013 census, 61,839 people said they were Cook Islanders.

### Economy

With about 150,000 visitors travelling to the islands in 2017, tourism is the country's main industry, and the leading element of

the economy, ahead of offshore banking, pearls, and marine and fruit exports. Manufacturing activities are limited to fruit-processing, clothing, and handicrafts.

The economy of the Cook Islands, as in many other South Pacific nations, is hindered by the isolation of the country from foreign markets, lack of natural resources, periodic devastation from natural disasters, and inadequate infrastructure.

The estimated GDP of Cook Islands in 2017 was US\$298 million and has an average income per capita of US\$14,118. The ADB projects that GDP will rise by 3.5% in 2018.

The Cook Islands uses the New Zealand Dollar as currency.

## Electricity Sector

### Electrification

The current electrification rate in the Cook Islands is estimated at over 99%. Peak demand, on Rarotonga, is some 5MW and annual generation is 26 GWh. The retail current tariff is NZ\$0.74/kWh

### Generation Developments

Donor and development bank support has allowed the installation of solar PV facilities on the outer islands so that 10 of the 12 inhabited islands now have essentially 100% renewable generation.

On Rarotonga generation is 16-18% renewable, from solar PV installations, with the remainder supplied through diesel plant. With donor funds TAU has installed a 1MW solar PV facility at the airport and there is an additional 2MW of solar capacity provided through gross metering arrangements with commercial and residential consumers.

Through this scheme TAU purchases electricity under a 5+5 year PPA with a tariff of NZ\$0.45 / kWh for the first period and a tariff equivalent to 49% of the then-applicable-average-retail-tariff for the second 5-year period.

The grid is currently near saturation with intermittent solar PV and TAU are installing battery facilities to provide storage and grid stability; 1MW/4MWhr, 1MW/2MWhr, 2MW/4MWhr units.

It is anticipated that there will be a need for an additional 11MW of solar in order to achieve the 70% target. In addition, a potential site for a 2MW wind installation has been identified and discussions are proceeding with landowners. The location for pumped storage hydro plant has also been identified and again some discussion has occurred with landowners; this is seen as an essential element of the power system going forward.

As land is scarce and public land limited, involving commercial and residential clients in future growth of solar PV seems very likely. Local banks are willing to continue support, through mortgage lending, though as the volume of installations builds there could be some limits in a relatively small scale national investment pool, around NZ\$250 million in total.

## Te Aponga Uira

### Background

Te Aponga Uira (TAU) is a government-owned power authority responsible for generation, distribution, and retailing of electricity on the main island of Rarotonga.

Power assets in the outer islands are maintained by the island administration committees (IACs), who are governed by the Island Government Act 2013. The Island Government Act provides clear processes for IAC financial management. The National Government provides annual budget allocations to IACs based on approved plans that are to be reported and monitored to ensure accountability.

### Financial Performance

TAU's financial performance has been solid from 2014 to 2016. In 2014, its operating ratio was around 82.0%, the return on net fixed assets was 17%, the current ratio was 5.3%, and the debt to equity ratio was 12%. In comparison, TAU's 2016 financial performance saw an operating ratio at 64.0%, the return on net fixed assets at 21%, the current ratio at 5.3%, and debt to equity ratio of 10%.

## Republic of Fiji

<i>Population</i>	870,000	
<i>Access to Electricity</i>	98%	
<i>Installed Capacity</i>	237 MW	
<i>Annual Generation</i>	934 GWh	
<i>Renewables Target</i>	80% by 2020	
<i>Current RE Production</i>	56% (2017)	
<i>Additional RE to reach target</i>	15-20MW of solar PV plus 100MW hydro	
<i>Potential Investment</i>	\$240 million	

### Fiji Existing and Potential Projects

Project	Location	Island	Technology	Short description	Capacity (MW)	Year
<b>Projected Pipeline and Proposals</b>						
Viti RE Ltd	Nadi	Viti Levu	Solar PV	Joint venture between Sunergise and EFL. Funding being finalised.	5 MW	2018
Navua Hydro	Waivaka	Central Viti Levu	Hydro	Unsolicited bid; negotiations continuing	48 MW	
Additional Solar	Various	Viti Levu	Solar PV	2 or 3 additional projects; timing unclear.	10-15MW	2018?
Upper Wailoa Diversion	Qaliwana	Viti Levu	Hydro	Negotiations have been suspended	36 MW	
Lower Ba Hydro	Lower Ba	Western Viti Levu	Hydro	Full feasibility supported by EIB.	18MW	

<b>Existing IPP Facilities</b>						
Tropic Wood Industries	Western	Viti Levu	Biomass	Wood chip waste - not operational	9 MW	2008
Fiji Sugar Corporation	Lautoka	Viti Levu	Biomass	Seasonal excess - no PPA	5 MW	2009
Fiji Sugar Corporation	Labasa	Viti Levu	Biomass	Difficulties in meeting PPA requirements	2x10MW	2013
Nabou Green Energy Ltd	Nabou	Viti Levu	Biomass	GIMCO plant was commissioned late in 2017 and is undergoing initial operations	10 MW	2017



## The Country

Fiji is a small island nation in the South Pacific Ocean with a population of 870,000. It has an area of 18,000 square kilometers spread over 330 islands, of which about 110 are inhabited. Most of the population lives on two large islands, Viti Levu and Vanua Levu.

## Economy

Fiji has one of the most sophisticated economies among the Pacific Islands. The economy is the second largest in the Pacific, after Papua New Guinea, and it is the most industrially advanced, with substantial services and manufacturing sectors. It is a hub for re-exports to the rest of the Pacific. It is also somewhat unusual in the Pacific in that it has developed a major tourism industry, which now attracts over 750,000 tourists a year and contributes about 38 percent of GDP.

The estimated GDP of Fiji in 2017 was US\$ 4.8 billion and has an average income per capita of US\$5,233. The ADB projects that GDP will rise by 3.6% in 2018.

## Electricity Sector

### Electrification

The current electrification rate in Fiji is estimated at over 98%. EFL has an extensive grid system on Viti Levu and three smaller grids on Vanua Levu and Ovalau. Over half of Viti Levu's power comes from hydro, diesel generators, a 10 MW wind farm, and some power generated privately from burning bagasse and wood mill waste (Fiji Sugar Company & Tropik Wood Industries Ltd), though the performance of these two plants has been inconsistent. A new biomass plant has been commissioned under an IPP agreement with GIMCO.

## Generation Developments

With solar PV's continual cost reductions, there has been some reluctance to consider solar opportunities with long term, fixed price PPA arrangements. However, an earlier feed-in-tariff regime has ended and EFL's historical focus on hydro and biomass is now moving to include solar PV.

The Korean (GIMCO) biomass project, built under an IPP scheme with a PPA with EFL, was commissioned late in 2017. The plant is growing its own fuel source that is used to complement a supply of wood waste.

The Qualiwana hydro, originally to be developed by Hawkins from New Zealand, has not proceeded; further studies are underway on this project. Negotiations on the Navua 48MW Hydro (noted as unsolicited bid) are progressing.

It is understood that EFL and Sunergise are near to financial close on a 5MW solar PV project. An SPV company, Viti RE, 51% EFL, 49% Sunergise, has been formed to build and operate the facility under a PPA with EFL. EFL has an additional 4x5 MW solar PV plants planned over the next 3-4 years.

### Peak Demand & Load Growth

FEA has about 240 MW of installed capacity, including over 120 MW of hydro. The peak load is some 150 MW. Viti Levu accounts for 90% of generation. Load growth is about 5%.

## Energy Fiji Limited (Formerly FEA)

### Background

In April 2018, the Fiji Electricity Authority (FEA) became Energy Fiji Limited (EFL). EFL is a wholly Government of Fiji owned statutory body that was established under the Electricity Act of 1966. EFL is responsible for the Generation, Transmission and Retail of electricity on the larger islands, Viti Levu, Vanua Levu and Ovalau, which account for some 90% of the country's population.

Installed generation capacity is approximately 237MW, comprising 80MW Monasavu Hydro Scheme and 40MW Nadarivatu Hydro Scheme in Viti Levu and about 112MW of diesel capacity in 14 stations on the three main islands. Of the diesel capacity 92MW is on Viti Levu which has been supplementing the Monasavu hydro scheme for the Viti Levu Interconnected System (VLIS) which has been reaching maximum demand of 152MW.

Transmission is provided by 145km of 132kV lines (connecting Wailoa & Nadarivatu Hydro Power Stations to the East and West coasts) and about 350km of 33kV lines. Power distribution is by means of more than 8,000km of 11kV and 415/240V lines.

EFL supplies about 934 GWh of energy per annum and serves a total customer base of over 175,000. Peak demand is some 152 MW. The average power generation mix

is 53.05% hydro, 45.45% diesel and heavy fuel oil, 0.39% wind with the remaining 1.1% provided by the Independent Power Producers (IPPs), Tropik Wood Industries Limited (TWIL) and Fiji Sugar Corporation (FSC). In 2016, the EFL renewable power stations generated 499.1 million units of electricity (53%), thermal power stations generated 424.51 million units of electricity (45%) and Independent Power Producers (IPPs) generated 10.43 million units of electricity (2%).


### Financial Performance

In 2016 EFL recorded a profit of \$59.6m after tax, up from \$39.7m in 2015. The shareholder value of EFL increased from \$647m as at the end of 2015 to \$706m in 2016. Total assets stand at \$1.22 billion. EFL's balance sheet continues to display a strong position, despite the adverse impact of the tropical cyclone Winston costs on EFL's financials in 2016.



The Korean (GIMCO) biomass project, built under an IPP scheme with a PPA with EFL, was commissioned late in 2017. The plant is growing its own fuel source that is used to complement a supply of wood waste.

## Papua New Guinea

<i>Population</i>	8,085,000	
<i>Access to Electricity</i>	12.4%	
<i>Installed Capacity</i>	580 MW	
<i>Annual Generation</i>	1,127 GWh	
<i>Renewables Target</i>	75% by 2030	
<i>Current RE Production</i>	41% (2017)	
<i>Additional RE to reach target</i>	Some 220 MW of Hydro plus 200 MW of other RE	
<i>Potential Investment</i>	Some \$1 billion	

### Papua New Guinea Existing and Potential Projects

Project	Technology	Capacity (MW)	Annual Generation (GWh)	Year
<b>Projected Pipeline and Proposals</b>				
Markham Valley	Biomass	15-30	123.5	2019
Naoro Brown	Hydro with reservoir	80	560	2020
Edevu	Hydro with reservoir	51	252	2021
Ramu 2	Hydro with reservoir	180	900	2021
<b>Existing PPL RE</b>				
Warangi	Hydro run of river	9.5	36.3	1983
Ramu 1	Hydro with reservoir	60	298.8	1990
Yonki ToD	Hydro with reservoir	10	47.5	2014
<b>Existing IPP Facilities</b>				
Pauanda	Hydro run of river	10	26.2	1983
Baiune	Hydro run of river	10	62.7	2006

## The Country

Papua New Guinea (PNG) occupies the eastern half of the island of New Guinea and many outlying islands. It covers a total area of 462,840 sq. km out of which 452,860 sq. km is land area. The capital city of the country is Port Moresby and other major cities are Lae and Mt. Hagen. The estimated population of the country in 2016 was around 8.0 million. The currency of the country is Kina (PGK).

## Economy

Agriculture land is 2.6% of total land area and major agricultural products of the country are coffee, cocoa, copra, palm kernels, sugar, tea, rubber, sweet potatoes etc. 85% of the people get subsistence livelihoods from agriculture. The country is richly endowed with natural resources like copper, gold, silver, natural gas, oil, timber and fisheries. The industries of the country include copra crushing, palm oil processing, woodchip production, plywood production, crude oil production, mining of silver, gold and copper and tourism. The country had estimated GDP of US\$ 20.8 billion in 2017 with a GPD per capita of US\$2,560.

## Political/Legal

The country gained independence from the Australian-administered UN Trusteeship on 16 September 1975. The Government of the country is Constitutional monarchy with parliamentary democracy. As a result of starting of exports of LNG, PNG's GDP grew by 13.3% in 2014 and 9.9% in 2015. The Medium-Term Development Plan (MTDP) of PNG for 2011-15 recognized the need for private sector partnerships in generation, transmission and distribution as investments required are beyond the capacity of PPL.

## Electricity Sector

### Capacity

The electricity generation capacity of PNG is 580 MW, spread across several separate networks. Around half of the electricity is generated through hydropower and one third through diesel plants. The rest of generation is contributed by gas and geothermal energy plants. Installed power capacity of private sector mines is some 280 MW.

### Electrification

It is estimated that some 12.4% of the population of the country has electricity access. It is mainly in urban areas that people have access to grid electricity but in rural areas access to electricity is quite poor at around 4%. MTDP has objective of providing electricity access to 70% of the population by 2030.

### Generation

The country needs large-scale investments to increase electricity access and to meet rising demand. Under the National Electrification Roll-out Plan (NEROP) which seeks to deliver electricity to 70% of the population by 2030 an estimated investment of some \$1.4-1.7 billion could be required. The Papua New Guinea Development Strategic Plan (PNGDSP) for the period to 2030 estimates that peak demand for electricity will increase to 700 MW by 2021 and 1400 MW by 2030.

The plan also targets making investments to upgrade and rehabilitate existing grid systems and reducing non-technical losses in the system and aims to increase generation from hydropower and gas based generation and phase out diesel power generation.

PPL is currently undertaking a significant review of future generation options with World Bank assistance.



## Utility

### Background

PNG Power Ltd (PPL) operates three grid systems in the country: Port Moresby System, the Ramu System and the Gazelle Peninsula System.

From an operational point of view, PPL is a state owned enterprise and is licensed under the electricity industry act to generate, transmit, distribute, and sell electricity in PNG. It also has exclusive right to supply small customers (<10 MW) within 10 kilometers of its network throughout PNG. A number of independent power producers (IPPs) are also active in the country. The Department of Public

Enterprise is the delegated owner of all state-owned entities, including PPL. Its role is to increase investments, productivity and transformation of the SOEs so as to drive growth and industrialization through Kumul Consolidated Holdings Ltd (KCHL), a trustee owner and all-encompassing authority for all state-owned assets and enterprises.


### Financial Performance

PPL's operational performance is weak and it has not issued recent accounts. It is however understood to suffer losses of some 20%. There is strong donor support directed at improving the shortcomings of PPL.



MTDP has objective of providing electricity access to 70% of the population by 2030.

## Samoa

<i>Population</i>	197,000	
<i>Installed Capacity</i>	42 MW	
<i>Access to Electricity</i>	94%	
<i>Annual Generation</i>	132 GWh	
<i>Renewables Target</i>	100% by 2017	
<i>Current RE Production</i>	24% (2017)	
<i>Additional RE to reach target</i>	15-20MW of solar PV plus 5MW hydro	
<i>Potential Investment</i>	\$80 million	

### Samoa Existing and Potential Projects

Project	Location	Island	Technology	Short description	Capacity (MW)	Year
<b>Projected Pipeline and Proposals</b>						
Savai'i Hydro		Savai'i	Hydro	Likely to be grant funded EPC	2.0 MW	
Shanghai E Power	Mt Lepue	Upolu	Solar PV	Not yet started	7.5 MW	
Wind Development		Savai'i	Wind	Looking at possibility	2.0 MW	
Biomass		Savai'i	Biomass	Joint Govt Agency Project	1.0 MW	
<b>EPC Facilities</b>						
EPC Solar	Tanugamanono	Upolu	Solar PV	Fully commissioned and operational	0.15MW	2014
EPC Solar	Vaitele	Upolu	Solar PV	Fully commissioned and operational	0.25MW	2014
EPC Solar	Gym 3	Upolu	Solar PV	Fully commissioned and operational	0.19MW	2014
EPC Solar	Racecourse	Upolu	Solar PV	Fully commissioned and operational	1.76MW	2014
EPC Wind	Vailoa	Upolu	Wind	Fully commissioned and operational	0.55MW	2014
<b>Existing IPP Facilities</b>						
Green Power Samoa	Airport	Upolu	Solar PV	Fully commissioned and operational	2.0 MW	2015
Sun Pacific Energy	Airport	Upolu	Solar PV	Fully commissioned and operational	2.0 MW	2015
Solar for Samoa	Airport	Upolu	Solar PV	Fully commissioned and operational	2.5 MW	2016
Green Power Samoa	Racecourse	Upolu	Solar PV	Fully commissioned and operational	2.0 MW	2016
Solar for Samoa	Racecourse	Upolu	Solar PV	Fully commissioned and operational	1.5 MW	2016
Piu Village Biomass	Piu Village	Upolu	Biomass	Pilot project, yet to be connected to grid	0.025 MW	2016
Louis Berger	Salelonga	Savai'i	Solar PV	Under dispute in court	2.0 MW	2017
Sun Pacific Energy	Airport	Upolu	Solar PV	Fully commissioned and operational	1.5 MW	2018

## The Country

Samoa is located in the Oceania group of islands in the South Pacific Ocean, about halfway between Hawaii and New Zealand. Samoa, the Polynesian group of islands, consists of two main islands Upolu and Savai'i and seven smaller islets. Three-quarters of the population of the country are located in Upolu on which the capital city, Apia, is located. The total area of the country is 2,931 sq. km. The currency is Tala or Samoan dollar (2.55 Tala/USD in June 2018). The languages of the country are Samoan (Polynesian) and English. As per World Bank, the population of Samoa was 197,619 in June 2018 with 80% of the population living in rural areas.

## Economy

The economy of the country is mainly dependent on tourism, agriculture, fisheries, remittances and external development assistance. Two-thirds of labour force of the country is engaged in subsistence agriculture and fishing. The major industries are food processing, building materials and auto electrical harnesses production. The estimated GDP of Samoa in 2017 was US\$ 806 million and has an average income per capita of US\$4,030. The ADB projects that GDP will rise by 0.5% in 2018.

## Political/Legal

In December 2014 the cabinet approved a new Public Private Partnership (PPP) Policy for guidelines on identifying and implementing PPPs. In January 2015 the cabinet approved a new State Owned Enterprise (SOE) Ownership, Performance and Divestment Policy and it is expected that its implementation will result in reforms of SOEs and more privatizations.

## Electricity Sector

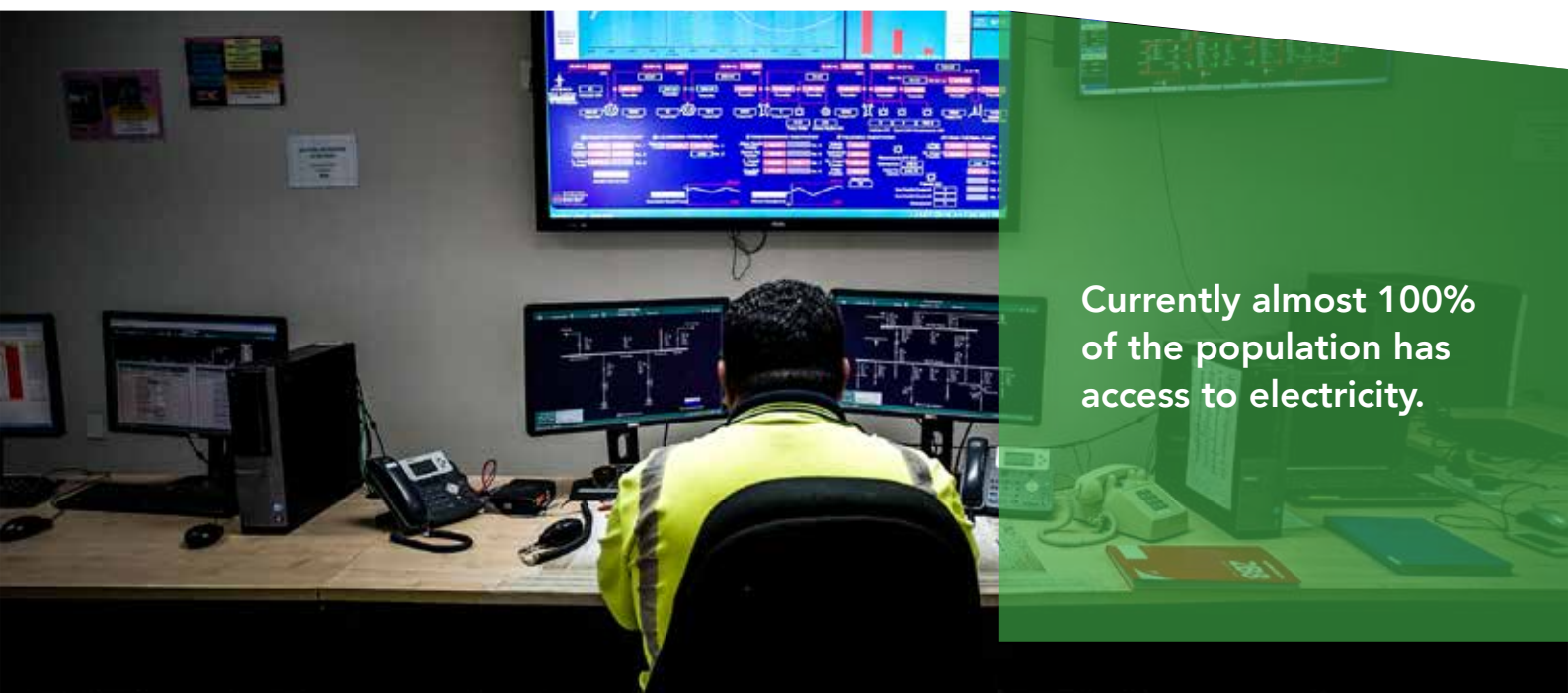
### Capacity

Samoa had total installed grid-connected power capacity of 42 MW in 2016. The electricity consumption in Samoa is around 132 gigawatt-hours (GWh) per year, 90% of which is sold on Upolu. EPC has some 36,000 customers across the country.

Since 2015 a combination of 2.35 MW of donor funded solar PV installations and a 0.55 MW wind installation have been complemented with 12.43 MW of IPP solar PV and 4.7MW of hydro generation. This has seen the renewable generation contribution reach some 24% of grid-based production in 2017.

### Electrification

Currently almost 100% of the population has access to electricity.



Currently almost 100% of the population has access to electricity.

## Tariff

The electricity tariff is mid-range of all Pacific island countries. Dependence on diesel fuel is anticipated to reduce as the country's electricity generation moves to a higher proportion of renewable energy sources.

However, progress in the construction of a pumped storage facility, the expansion of existing hydro facilities and additional wind installations has not been as quick as anticipated.

The total tariff charge per kWh (for domestic consumption in excess of 100 kWh/month and non-domestic consumption) is ST\$ 0.97. For prepayment meters, domestic consumption from 1-100 kWh usage tariff is about \$0.87 per kWh. A request for an increase in tariffs is under consideration by the regulator (2018).

## Policy & Plans

The Electricity Act 2010 established the role of the Electricity Regulator and opened opportunities for Independent Power Producers (IPPs) to generate and sell electricity to EPC. As noted, there are now three IPP providers offering solar PV, typically on a PPA that anticipates generation of some 3.5 GWh per annum.

With this level of intermittent power connected to the grid, EPC is arranging for the early installation of battery storage facilities; while no curtailment has been necessary so far, the decision was taken not to accept an additional 2 MW of solar PV offered by Green Power Samoa, an existing IPP.

The Electric Power Corporation is working on plans for additional IPP solar PV installations; to meet the target of 100% RE by 2025 a further 15MW of solar PV, in conjunction with a planned 25 MW wind farm and possible hydro installations, could be required.

## Electric Power Corporation, Samoa

### Background


EPC is a wholly government-owned corporation and the sole utility that is responsible for managing the electricity sector in the country. It has necessary powers and legislations to carry out the functions of generation, transmission, distribution and selling of electricity. It was established in 1972 by the Electric Power Corporation Act 1972. The corporation is governed by an eight-member board of directors with its own chairman appointed by Cabinet. The Board includes the Chief Executive Officer of the Ministry of Finance as ex-officio.

### Financial Performance

During 2014-15, EPC recorded a net operating profit of ST\$ 11.78 million on total income of ST\$ 131 million, out of which income generated from electricity sales was ST\$ 120 million. Out of total expenses of ST\$ 117.1 million, imported fuel contributed ST\$ 63 million or 53% against electricity sales. As on June 30, 2015 the corporation had gross fixed assets of ST\$ 386 million. The total equity of the corporation was ST\$ 219 million as against borrowings of \$156 million.



## Solomon Islands

<i>Population</i>	620,000	
<i>Installed Capacity</i>	32.6 MW (Honiara)	
<i>Access to Electricity</i>	23%	
<i>Annual Generation</i>	85.5 GWh (Honiara 77.9 GWh)	
<i>Renewables Target</i>	50% by 2020;	
<i>Current RE Production</i>	5% (2017)	
<i>Additional RE to reach target</i>	Some 8 MW of solar and 15 MW of hydro	
<i>Potential Investment</i>	\$300 million	

### The Country

The Solomon Islands is the third-largest of the Pacific Island Countries. The Solomons is a sovereign country consisting of six major islands and over 900 smaller islands, 350 inhabited, lying to the east of Papua New Guinea and northwest of Vanuatu. The country is spread over 1.35 million km<sup>2</sup> with a land area of 29,785 km<sup>2</sup>. The current population is some 620,000, growing at 2% per annum, with around 86% rural and the urban population of 100,000, living in one city, Honiara.

### The Economy

Solomon Islands is one of the Pacific's poorest countries, with high costs of service delivery due to a small and geographically dispersed population. The majority of the population is involved in subsistence/cash crop agriculture, with less than a quarter involved in paid work. Agriculture and raw materials (including logging) accounted for 92 per cent of exports, leaving the narrow-based economy vulnerable to shocks.

The Solomon Islands is classified as an International Development Agency (IDA) country with a per capita GDP of about US\$2,100 per year (2017). National GDP was US\$1.273 billion in 2017 and is expected to grow at some 3% in 2018.

### Electricity Sector

#### Electrification

The current electrification ratio in Solomon Islands is estimated at 23%, which may be as low as 5% in some rural areas. In Honiara, about 70% of households have electricity connections.

The wide distribution of the population and the low densities make the capital costs of connecting consumers very high relative to the revenue generation.

#### Peak Demand & Load Growth

Peak demand in Honiara is around 14MW. Electricity demand is forecasted to grow at around 5% per year. Significant work is being considered to replace the existing diesel-based generation capacity. The pending Tina river hydro project, at 11MW in capacity, could help displace a major portion of current diesel generation that supplies Honiara.

#### Tariffs

A major obstacle in expanding the use of electricity and promoting economic development is the average retail electricity tariff of approximately US\$0.80/kWh, which is the highest in the Pacific and among the highest in the world. This is due to the extreme reliance on expensive diesel generation. Solomon Power's cost of supply (generation and distribution) peaked at US\$0.94/kWh in 2014.

## Solomon Islands Existing and Potential Projects

Project	Location	Province	Technology	Short description	Capacity (MW)	Year
<b>Projected Pipeline and Proposals</b>						
Hybrid Generation systems in Hauhui, Vonunu, Sasamunga, and Vonunu	Hauhui	Malaita	Solar, Battery, Gen	The project will construct a total of up to 2MW Hybrid system at new proposed sites which were identified based on good access for construction, average 150 potential customer per site, and potential for growth in terms of economic activities. The project extends SP grids to rural communities while also ensuring renewable energy technologies are utilised.	0.3	2019
	Vonunu	Western	Solar, Battery, Gen		0.3	2019
	Sasamunga	Choiseul	Solar, Battery, Gen		0.3	2019
	Namugha	Makira	Solar, Battery, Gen		0.3	2019
Electricity Access and Renewable Energy Expansion Project (EAREEP)	Fighter 1	Honiara	Solar	The project will expand on the constructed and commissioned Solar Farm at Fighter 1 by an additional 2 MW.	2	2019
	Lungga	Honiara	Solar	The project involves development of a new solar farm at Lungga in Honiara which will provide a new point of supply thus reducing dependency on diesel in the Honiara grid.	4	2019
	Tanagai	Honiara	Solar	The project involves development of a new solar farm at Tanagai in Honiara which will provide a new point of supply thus reducing dependency on diesel in the Honiara grid.	1	2019
Electricity Access and Renewable Energy Expansion Project (EAREEP) Honiara PV Plants	Ranadi	Honiara	Solar	The project will provide SP office building in Ranadi with additional Solar Power installed on the roof top.	0.4	2019
Auki Solar PV Plant	Kwainamoro	Malaita	Solar	The project involves development of a new solar farm at Auki in Malaita province which will provide a new point of supply thus reducing dependency on diesel in the Auki grid.	1.5	2019
Solar Power Development Project	Munda	Western	Solar, Battery, Gen	The project will construct a total of 2MW grid-connected solar power generation at five provincial grids. Installed solar power capacity will be Kirakira (320 kilowatt[kW]), Lata (290kW), Maluu (140kW), Munda (1,000kW) and Tulagi (250kW). The project will include installation of battery storage which will allow high penetration rates of intermittent solar power. Battery storage sizing has been optimized and will replace between 66% and 87% of diesel generation at each of the 5 sites. The tender closed on 8th November 2017.	1	2019
	Kirakira	Makira	Solar, Battery, Gen		0.32	2019
	Lata	Temotu	Solar, Battery, Gen		0.29	2020
	Maluu	Malaita	Solar, Battery, Gen		0.14	2020
	Tulagi	Central	Solar, Battery, Gen		0.25	2020

Project	Location	Province	Technology	Short description	Capacity (MW)	Year
Hybrid Generation systems in Ulawa, Santa Ana, Visale, and Lambi	Ulawa	Makira	Solar, Battery, Gen	The project will construct a total of up to 2MW Hybrid system at new proposed sites which were identified based on good access for construction, average 150 potential customer per site, and potential for growth in terms of economic activities. The project extends SP grids to rural communities while also ensuring renewable energy technologies are utilised.	0.3	2021
	Santa Ana	Makira	Solar, Battery, Gen		0.3	2021
	Visale	Guadalcanal	Solar, Battery, Gen		0.3	2021
	Lambi	Guadalcanal	Solar, Battery, Gen		0.3	2021
Tina River Hydro Development Project	Tina	Guadalcanal	Hydro	This project will involve the construction of a 15MW capacity Hydro plant with the aim of reducing dependency on diesel plants in the Honiara grid.	15	2022

Existing SP Renewables						
Henderson 1MW grid-connected Solar	Fighter 1	Honiara	Solar Energy	The project bolstered energy resilience and has reduced costs associated with diesel imports.	1	2016
Solar PV Plant	Ranadi	Honiara	Solar Energy	The project involved the installation of a 50kW solar PV system on the car park roof top at Ranadi which was completed in August 2014.	0.05	2014
Hybrid Generation systems in Seghe and Taro	Taro	Choiseul	Solar, Battery, Gen	The project constructed a total of 400kW solar power generation at two separate new outstations in Seghe and Taro in Western and Choiseul province respectively. The project included installation of battery storage which allows high penetration rates of intermittent solar power.	0.224	2017
	Seghe	Western	Solar, Battery, Gen		0.168	2017

## Solomon Islands Electricity Authority - Solomon Power

Solomon Power, is the state-owned, vertically-integrated power utility and is the main supplier of electricity in the country, responsible for electric power generation, transmission and distribution to all urban and provincial centers, including Honiara, nine provincial centers (so-called "outstations") and Noro Township in the Western Province.

Solomon Power supplies electricity to urban centers through diesel generators. Solomon Power's Honiara power system is almost entirely diesel-based, except for a 50 kilowatt (kW) rooftop photovoltaics (PV) pilot project at Solomon Power's headquarters and a 1 Megawatt (MW) solar farm commissioned in 2016. The total installed generation capacity in Honiara is 32.6 MW, but its available (de-rated) capacity is 30.7 MW.

The total energy production in 2015 was 85.5 GWh, of which 77.9 GWh (90 percent) was for the Honiara grid.

### Generation Developments

The Solomon Islands government aims to increase the share of renewable energy to 50 percent of total installed capacity by 2020. Apart from the small solar home systems, development of renewable energy has been slow in the Solomon Islands largely due to the weak financial position of Solomon Power.

Until mid-2011, the only prominent renewable energy sources operated by Solomon Power were the mini-hydros supplying Buala town on Isabel Province and Malu'u substation in Malaita. Now Solomon Power is developing three outstations with solar-diesel hybrid systems, and project preparation is underway to hybridize some of the existing diesel-based outstations.


In addition, Solomon Power is also preparing to develop the 500 kW Fiu River Hydropower Project to connect to the Auki grid on the island of Malaita with financing from ADB. A number of donors are supporting the Government of the Solomon Islands to facilitate private investment into the 15 MW Tina River Hydro Project, which will feed into the Honiara grid under an IPP agreement.

It is considered that there is potential for solar PV generation and it's complementary to the Tina River project under development. The daily load profile with maximum demand at mid-day makes PV with coinciding peak output hours a favorable option. However, PV projects need to include storage and/or be combined with other type of compensation for the intermittency of the solar resource.

There is a willingness to consider IPP options across these developments but current laws and regulations need updating.

### Financial Performance

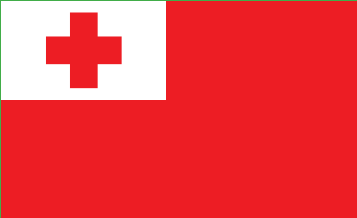
Solomon Power, according to its annual report, recorded net revenues of SBD 450m (US\$57.9m) in 2016 and a profit of SB\$120m (USD15.4m).



The current electrification ratio in Solomon Islands is estimated at 23%, which may be as low as 5% in some rural areas.



# Tonga

<i>Population</i>	109,000	
<i>Installed Capacity</i>	17.3 MW (Tongatapu)	
<i>Access to Electricity</i>	96%	
<i>Annual Generation</i>	66 GWh	
<i>Renewables Target</i>	50% by 2020; 70% by 2030	
<i>Current RE Production</i>	9% (2017)	
<i>Additional RE to reach target</i>	15 MW of RE plus 20MWh storage	
<i>Potential Investment</i>	\$80 million	

## Tonga Existing and Potential Projects

Project	Location	Island	Technology	Short description	Capacity (MW)	Year
<b>Projected Pipeline and Proposals</b>						
Additional Grid Tied Solar Extension		Tongatapu	Solar PV	IPP invitation issued April 2018 and tenders rec'd	6	2018
Wind project		Tongatapu	Wind	Call anticipated in late 2018	8	2020
<b>Existing / Planned TPL RE Facilities</b>						
Grid tied solar	Maama Mai	Tongatapu	Solar	First large scale solar PV	1	2012
Grid tied solar	Vaini	Tongatapu	Solar	2nd large scale solar	1.3	2015
Wind project	Niutoua	Tongatapu	Wind	5x275kW turbine project under construction	1.3	2019
<b>Existing IPP Facilities</b>						
Singyes Solar		Tongatapu	Solar PV	First large scale IPP in Tonga	2	2017

## The Country

Tonga is a Pacific country of 177 islands with an estimated population of 109,000. Its main island groups are Tongatapu, Ha'apai, Vava'u, 'Eua, and Niua group (comprising Niuatoputapu and Niuafo'ou).

About 36 of the islands have permanent settlements, and more than 75% of the country's people live on Tongatapu, the main island and the location of the capital, Nuku'alofa. The currency of the country is Pa'anga (TOP).

## Economy

Tonga's economy is characterized by a large non-monetary sector and a heavy dependence on remittances from the half of the country's population that lives abroad, chiefly in Australia, New Zealand, and the United States.

Tonga has a small, open island economy and is the last constitutional monarchy among the Pacific Island countries. It has a narrow export base in agricultural goods. Squash, vanilla beans, and yams are the main crops. Agricultural exports, including fish, make up two-thirds of total exports. Tourism is the second-largest source of hard currency earnings following remittances. Tonga had 53,800 visitors in 2015. The country must import a high proportion of its food, mainly from New Zealand.

The country had estimated GDP of US\$ 587 million in 2017 with a GPD per capita of US\$5,600.

## Political/Legal

The Executive arm of government in Tonga is a merger between the monarchy and the cabinet. The King runs the state, and the Prime Minister runs the government. The monarchy is exclusively comprised of nobles. Tonga's prime minister and cabinet are appointed by the monarch.

## Electricity Sector

### Capacity

Peak demand on the four TPL grids in 2016 was about 11.1 megawatts (MW), and demand for the year totalled about 55 gigawatt-hours. An estimated 13 million litres of diesel fuel were used to generate this electricity at a cost equivalent to about 10% of total gross domestic product and 15% of the value of total imports. It is expected that the peak capacity demand will increase to 17.2 MW by 2020 and that annual consumption will rise to 66 gigawatt-hours.

### Electrification

It is estimated that 96% of people across the country have access to electricity. On the TPL concession islands of Tongatapu, 'Eua, Ha'apai, and Vava'u, the electricity

tariff in July 2016 was \$0.33 per kilowatt-hour (kWh). This comprised a base energy rate (or nonfuel component) of \$0.21 and a variable fuel surcharge component of US\$0.12. The electricity provider has rights under the concession contract to pass fuel costs on to consumers and charge an inflation-indexed nonfuel tariff.

## Generation

Tongatapu has diesel generation with a capacity of 13.9 MW. In addition, there is the 1.4 MW Maama Mai solar farm with a 500kWh lithium capacitor. The Vaini solar installation, again with a 500kWh lithium capacitor and Tonga's first large scale IIP is a 2 MW solar facility, expected to deliver some 2.8 Gwh in its first year of operation. Tenders for additional 6 MW solar facilities are being evaluated and a 5 x 275 kW wind farm is expected to be commissioned in 2019 through JICA.

## Utility

### Background

Tonga Power Limited (TPL) is solely responsible for providing grid-connected electricity services in Tonga. TPL is a vertically integrated public enterprise wholly owned by the government and under the oversight of the Ministry of Public Enterprises and the government cabinet. It has concessions to operate four independent grids—the largest, which is on the main island of Tongatapu, and three smaller grids on the main islands of the 'Eua, Ha'apai, and Vava'u island groups. TPL generates, distributes, and retails electricity, and provides operation and maintenance (O&M) services.

### Financial Performance

With a Revenue of \$48.5 million in 2017 Tonga Power achieved a strong financial result recording an after tax profit of \$5.53M, a steady increase from \$5.49M in 2016. Shareholder value of Tonga Power increased from \$58.2M to \$60M at the end of 2017. The total borrowings at 30 June 2017 was \$23.8M and has increased by \$2.6M compared to June 2016. ROE at 9.2%, slightly below the 10% (2016-9.5%) target.

## Useful Reference Resources

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Papers presented at the **2018 Annual Meeting of the Pacific Power Association**  
<https://www.ppa.org.fj/27th-ppa-annual-conference-presentations/>

**Pacific Power Association Benchmarking Report**, Pacific Power Association, 2016  
<https://www.ppa.org.fj/benchmarking-report/>

**Stocktake of Energy Sector Institutions, Legislation, Policies and Fiscal Incentives in Fourteen Pacific Island Countries**, SPC Economic Development Division - Energy Programme, 2016  
<http://prdrse4all.spc.int/data/stocktake-energy-sector-institutions-legislation-policies-and-fiscal-incentives-fourteen>

**ADB Pacific Energy Sector Overview and Proposed Pacific Renewable Energy Investment Facility**, Asian Development Bank, 2017  
<https://www.adb.org/projects/49450-004/main>

**Renewable Energy in Pacific Small Island Developing States: the role of international aid and the enabling environment from donor's perspectives**, Elsevier, Renewable and Sustainable Energy Reviews Volume 82, Part 1, February 2018, Pages 343-352

**Private Sector Investment in the Pacific – Final Report**, New Zealand Institute for Pacific Research, September 2017  
<http://www.nzipr.ac.nz/research/private-sector-investment-in-the-pacific/>

**Pacific Private Sector Development Initiative: Progress Report, 2015-2016**, Asian Development Bank  
<https://www.adb.org/documents/psdi-progress-report-2015-2016>

**The Pacific Energy Country Profiles**, NZMFAT, 2016  
<http://prdrse4all.spc.int/data/pacific-energy-country-profiles-2016>

**A Guide to Investing in Renewable Electricity Generation in the Pacific**, International Finance Corporation, May 2018 – Draft in production

**Annual Reports** of all Pacific Island Utilities



## Abbreviations

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ACEF	Asia Clean Energy Forum
ADB	Asian Development Bank
ANZ	Australia New Zealand Bank
BOOT	Build, Own, Operate, Transfer (form of contract)
BSP	Bank of the South Pacific
CEO	Chief Executive Officer
CROP	Council of Regional Organisations in the Pacific
DFAT	Department of Foreign Affairs and Trade, Australia
EIB	European Investment Bank
EU	European Union
EPC	Electric Power Corporation, Samoa
EPC	Engineer, Procure, Construct (form of contract)
EFL	Energy Fiji Limited (formerly FEA)
FEA	Fiji Electricity Authority
FIT	Feed in Tariff
FSC	Fiji Sugar Corporation
FSM	Federated States of Micronesia
FWI	Fuel Wood Industries Limited
GGGI	Global Green Growth Institute
GCF	Green Climate Fund
GDP	Gross Domestic Product
GWh	Gigawatt-Hours
IFC	International Finance Corporation
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
JICA	Japan International Cooperation Agency
JV	Joint Venture
kV	Kilovolts
kW	Kilowatt
kWh	Kilowatt-Hours
MW	Megawatt
MWh	Megawatt-Hours
NDC	Nationally Determined Contributions
NZMFAT	New Zealand Ministry of Foreign Affairs and Trade
O&M	Operation and Maintenance
PCREEE	Pacific Centre for Renewable Energy and Energy Efficiency
PIC	Pacific Island Countries
PNG	Papua New Guinea
PPA	Power Purchase Agreement
PPA	Pacific Power Association
PPL	PNG Power Limited
PPP	Public Private Partnership
PRIF	Pacific Region Infrastructure Facility
PUC	Pohnpei Utilities Corporation
PV	Photovoltaic
RE	Renewable Energy
SOE	State Owned Enterprise
SPL	Solomon Power Ltd
TA	Technical Assistance
TAU	Te Aponga Uira
TPL	Tonga Power Limited
TWI	Tropik Wood Industries
UAE	United Arab Emirates
UNFCCC	United Nations Framework Convention on Climate Change



## **Appendix - Forum Agenda and Panels**

**PRIF and PPA wish to thank all those who participated in, and helped organise, the Forum in Palau in August, including the PRIF Energy Sector Working Group.**

# Agenda - Friday 3rd August 2018

(subject to change)

8:30 – 9:00	Registration	
9:00 – 9:10	Opening and Welcome Remarks	<b>Andrew Daka</b> , CEO, PPA
9:10 – 9:30	Highlights of the Third Pacific Energy Investors Forum Report: <b>Exploring the private sector opportunities in the Pacific Energy Markets</b>	<b>Mike Allen</b> , Consultant
9:30 – 10:30 <b>Panel 1</b>	<b>Panel 1: A utility view of the electricity market</b> <ul style="list-style-type: none"> <li>Engaging with IPPs</li> <li>Integrating intermittent generation</li> <li>Energy Storage Challenges and Solutions</li> <li>Diversification beyond solar PV</li> </ul>	<b>Apii Timoti</b> , CEO TAU, Cook Islands <b>Hasmukh Patel</b> , CEO, EFL, Fiji <b>Tile Leia Tuimalealiifano</b> , GM, EPC, Samoa <b>Pradip Verma</b> , CEO, Solomon Power <i>Moderated by <b>Mike Allen</b></i>
10:30 – 11:00	Coffee/tea break	
11:00 – 12:00 <b>Panel 2</b>	<b>Panel 2: A market view of opportunities</b> <ul style="list-style-type: none"> <li>Domestic capacity to meet market needs</li> <li>Deepening markets for the private sector</li> <li>IPP Options and opportunities</li> <li>Financing – bankable projects</li> </ul>	<b>Steve Anderson</b> , Andersons, Cook Islands <b>Terrence Liu</b> , Singyes, Hong Kong <b>Peter McGill</b> , Transnet, New Zealand <b>Isabel Neto</b> , World Bank, Sydney <i>Moderated by <b>Anthony Maxwell</b>, ADB, Sydney</i>
12:00 – 13:00	Lunch	
13:00 – 14:00 <b>Panel 3</b>	<b>Panel 3: Market influences &amp; support mechanisms</b> <ul style="list-style-type: none"> <li>The driving force of NDCs</li> <li>Aspirations and practical realities</li> <li>Market place support mechanisms</li> <li>Donors encouraging the private sector</li> </ul>	<b>Manuel Coxe</b> , IRENA, Bonn <b>Solomone Fifita</b> , PCREEE, Tonga <b>Martin Garrood</b> , MFAT, New Zealand <b>Peter Storey</b> , PFAN, Austria <i>Moderated by <b>Jane Romero</b>, PRIF, Sydney</i>
14:00 – 14:45 <b>Panel 4</b>	<b>Panel 4: Maximising the collective benefits of experience to date</b> <ul style="list-style-type: none"> <li>Adjusting to an IPP market</li> <li>Policy and Regulation</li> <li>Attracting the private sector</li> <li>Sharing Pacific experiences</li> <li>The role for the PPA in changing markets</li> </ul> <b>Open floor discussion</b>	<b>Brian Clayton</b> , Chapman Tripp, NZ <b>Andrew Daka</b> , PPA, Fiji <b>Hasmukh Patel</b> , CEO, EFL, Fiji <b>Anthony Maxwell</b> , ADB, Sydney <i>Moderated by <b>Jack Whelan</b>, PRIF, Sydney</i>
14:45 – 15:00	Close	<b>Andrew Daka</b> , PPA <b>Jack Whelan</b> , PRIF

# Overview of Panel Sessions

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## Panel 1: A utility view of the electricity market

In a discussion with the heads of Pacific power utilities, this session will look to share experiences in working with the private sector as new and renewable power facilities have been established. While these developments have been predominantly solar PV, from domestic/commercial gross metered arrangements under a FIT to 2-3MW grid connected IPP solar farms, there is also recent experience with a 10MW biomass operation.

Topics will include:

- attracting and engaging with the private sector to establish independent power producer (IPP) arrangements with competitive, long term power purchase agreements (PPA)
- reaching a balance in meeting national generation requirements while providing a commercially acceptable environment for the utility and the IPP
- providing for an increasing level of intermittent generation and how this is being addressed through various energy storage options
- a view on future sources of renewable generation, both as a source of electricity and as integral components for adequate storage and grid stability
- a look into future IPP opportunities

## Panel 2: A market view of opportunities

Drawing on those involved in the supply, installation, IPP project development and financing of renewable projects, this session will look to understand the private sector view point of the emerging markets in the Pacific.

Topics will include:

- the current level of national capabilities to support the renewables market in supplying and/or building appropriate facilities in the different markets across the region
- what can be done to encourage wider participation by the private sector and how can the commercial structure within markets be reinforced to increase the scale of opportunities in individual markets
- how are the current IPP opportunities viewed; what would ensure competitive offers with limited recourse for guarantees and security of PPAs
- is there IPP potential to offer storage and grid stability facilities – would this require a different mechanism from existing PPAs
- what would enable access to finance in what are small markets where transaction costs can be disproportionately high



### Panel 3: Market influences & support mechanism

There are a number of drivers for the current growth in renewables; displacement of high cost diesel generation, security of supply, delivering increased access to electricity and Nationally Determined Contributions (NDCs). Pacific island nations have taken a particularly strong position in setting their NDC targets; these are being used as a yardstick for progress in building the renewable energy contribution to national electricity supplies. Panelists are drawn from bilateral, regional and international agencies that are at the forefront of analysing, promoting and supporting access to clean energy.

Topics will include:

- what are the driving forces behind the NDCs and meeting these targets; how are the national goals being reconciled with the practical technical and commercial issues that utilities must face
- the aspirational nature of the NDC goals is acknowledged; what are the practical issues that will impact on these being reached
- what support mechanisms are available to help reinforce national and regional capabilities and capacity, both in the public and private sectors; what can they offer in the Pacific markets; what parallel experiences are there from island nations outside the Pacific
- how can grant supported projects reinforce opportunities for the private sector; where should the division be between their roles

### Panel 4: Maximising the collective benefits of experience to date

The focus of the Forum has been to look at the experiences across the Pacific island countries as all look to address the urgent need to move to cleaner forms of power generation. The magnitude of the developments required, in what are often small and less robust economies, mean that there will be a growing need for private participation in these markets. Successful growth will require market policies, regulations and commercial arrangements that are mutually acceptable for national needs and private sector participants. There is clearly a growing body of experience in the region and sharing this will provide support to both those who have engaged with IPPs and are looking to strengthen this aspect of their market and those who have yet to begin this journey.

Panelists bring legal, operational, power industry and financing experience to this discussion, looking to provide thoughts on how the market can be reinforced for all interested parties.

Topics will include:

- how future planning, project implementation and system operations need to adjust to accommodate IPP participation
- what policy and regulation issues are seen as critical to build markets with increasing private sector activities; the power purchase agreement and its central role
- how can the private sector be attracted to make long term commitments into regional markets
- what will the public-sector role in power generation look like going forward; near term and in the future
- how can the experience in the Pacific be most effectively shared; what are the key opportunities for the Pacific Power Association's contributions in the evolving regional markets



# Speaker Bios

## Dr Mike Allen – PRIF Consultant, Auckland, New Zealand

Mike has been involved in the renewable/clean energy industry for over 40 years with extensive international experience, particularly in the geothermal industry. He has lived and worked in Indonesia, Kenya and the United States, from where he managed an international group focused on the funding of renewable energy developments globally. In 2013 Mike was appointed a Special Envoy by the New Zealand Minister of Foreign Affairs to represent New Zealand interests in the Pacific, Caribbean and East Africa and in international renewable energy forums. As an independent consultant he has most recently undertaken assignments for MFAT, DFID, WB/SREP and IFC. He has been responsible for preparing the background report for the Pacific Energy Investors Forum.



## Apil Timoti, CEO, Te Aponga Uira (TAU), Rarotonga, Cook Islands

Apil Timoti was appointed as Chief Executive Officer of TAU in early 2001. He first joined TAU in 1998 as General Manager, Operations. Prior to joining TAU, Apil served as the Secretary of the Ministry of Energy. The CEO also worked with the power utility in the days that it was called the Electric Power Supply (EPS) before moving to Energy. More recently, Apil concluded a term as Chair of the Pacific Power Association – the regional body of power utilities, which has a secretariat based in Suva, Fiji.



## Hasmukh Patel, CEO, Energy Fiji Ltd (EFL)

Hasmukh joined the Energy Fiji Limited (EFL) in 1976 as a graduate Electrical Engineer and has served in numerous senior engineering and senior management positions covering technical, field and system operational aspects of electricity networks. Hasmukh left EFL at the end of 2005 as General Manager Network and became the Joint Managing Director of Kasabias Limited from January 2006 to July 2008 before being recalled to the helm of EFL in August 2008, and ever since has been in this role. Hasmukh has a First Class Bachelor of Technology degree in Electrical Engineering from the Indian Institute of Technology, Madras, India and a Graduate Certificate in Management from Monash in Australia. Hasmukh is a Chartered Electrical Engineer and a Member of the Institute of Electrical Engineers, UK and Australia to name a few.



## Tile Leia Tuimalealiifano – General Manager of the Electric Power Corporation of Samoa

Tile is a Mechanical Engineer by profession. He also holds a Masters in Business Administration from LATROBE University. He has lived and worked all his life in Samoa. He is the current General Manager of EPC since 2012. Before he became the General Manager of EPC, he was the Project Manager for Samoa Power Sector Expansion Project (USD100m) for five years and Manager Power Generation for 10 years. He has been involved in the electricity industry for over 30 years with extensive knowledge and experience in hydro and diesel power plants in Samoa. He is spearheading Samoa's target of 100% renewable by 2025. Has just launched the biggest ever battery storage in the Pacific of 8MW capacity x 13,400 KWH energy storage with total installed solar capacity of 14MW.



## Pradip Verma – CEO, Solomon Islands Electricity Authority, trading as Solomon Power

Pradip has a Bachelor's degree in Electrical and Electronics Engineering, Masters in Business Management, Diploma in Computer Programming and a Diploma in Company Directors Course, Australia. He is a Chartered Professional Engineer (Engineers Australia) and a Graduate Member of the Australian Institute of Company Directors. Pradip has extensive experience in strategy setting, regulation, tariff formulation, operations and maintenance, design, contracts, project management, telecommunications, engineering, environment and safety in the electricity utility industry in India, Algeria, Bahrain, Australia and Solomon Islands. Under Pradip's leadership Solomon Power has an aggressive program of works to install renewable energy in the grid and to increase the customer numbers by improving affordability and accessibility.



## SPEAKER BIOS

### Steve Anderson MBA – Director, Andersons, Rarotonga

Steve has worked in the energy field for 40+ years. Educated in NZ and the UK, he lives in the Cook Islands and has been involved with remote island electrification, both conventional and PV mini-grid, and BESS projects. His trading and contracting companies have completed a number of EPC solar installations for IPPs, various commercial property developments, and new export production lines. Twice president of the Cook Islands Chamber of Commerce, he has consulted for ADB and National Environment Service on energy efficiency and policy. He sits on various regulatory, advisory and SOE boards, and represented the Cook Islands on Energy Standards and Labelling, the Pacific Energy Summit, and the Pacific Forum Private Sector Dialogue.



### Isabel Neto, World Bank, Sydney

Isabel is a Senior Energy Specialist and Hub Coordinator for the World Bank's energy portfolio in the Pacific region, based in Sydney. She is managing and has managed in the past a wide range of projects covering areas such as access, network rehabilitation and expansion, to sector reform and regulation and the development of Public-Private Partnerships (PPPs). Her experience cuts across sectors, having worked both on energy and in the Information and Communications Technology (ICT) sectors. Prior to working in the Pacific region, has worked extensively across Africa but also in Europe, Latin America and South Asia. Isabel Neto is a graduate of the Technology and Policy Program at the Massachusetts Institute of Technology, and also holds a degree in Electrical Engineering. Prior to joining the World Bank, she worked on regulatory affairs in the private sector.



### Terrense Liu, Project Developer and EPC Contractor, Singyes, Hong Kong

For the past 10 years with Singyes Solar, Terrense has always been involved in the solar business development for the company in the international market, especially recent focus in the South East Asia and Pacific Region. Singyes Solar is a renewable energy project developer and EPC contractor itself. By working for it in both developing and constructing solar power projects, Terrense sees the success of a project not only related to the touching ground of a PPA and financial closure, but also a perfect system design and execution management. The Tonga 2MW Solar Power Plant Project is an example as explanation. Terrense always shares his understanding and experience with clients, helping both the company and the clients achieve great business success.



### Peter McGill – General Manager Energy Division, TransNet, Auckland

Peter has 30 years' experience managing energy related businesses in NZ Australia, Thailand, UK and lastly Tonga where he was the CEO and Director of Tonga Power. In 2012 Peter joined TransNet in its newly formed Energy Division which has a focus on demand side management and storage of renewable energy using redox flow technically and more recently working with redT in the UK on hybrid Li-ion – redox storage machines. During 2015 TransNet developed a strategy to test micro grid PPA opportunities in the South Pacific combining renewable energy with battery storage machines. This included TransNet installing a micro-grid consisting of 70kW solar and 30kW-130kWh energy storage system to power the company's National Distribution Centre in Auckland.



### Anthony Maxwell – Principal Energy Specialist and Energy Sector Lead, Pacific Department, Asian Development Bank

Anthony has over 22 years' experience in developing clean energy infrastructure projects in over 20 countries. Mr. Maxwell has been with ADB for over 13 years and worked in the Central Asia, East Asia and the Pacific regions. Mr Maxwell is a Chartered Professional Engineer (Australia) and a Member of the Institution of Engineers, Australia. Since joining the ADB Pacific Department, he has led on over 14 energy sector investment projects in 10 Pacific Island countries worth over US\$1.2 billion.



## SPEAKER BIOS

### Manuel Coxe, Head of Unit - Grid Integration, IRENA Innovation and Technology Centre, Bonn

Manuel is responsible for electrical grid operation and planning for the integration of renewable energy into the power network. Prior to joining IRENA, he held different technical and management positions along his career including as Researcher, Head of Department, Senior Advisor and Executive Director, respectively, with the University of Lisbon, the Portuguese Transmission System Operator (TSO) for electricity, the European TSO's industry Association, Consultancy and with the European energy market operators industry Association, in Brussels. His expertise and interests include electrical grid operation and planning, energy markets and energy policy. Manuel is an Electrical Engineer with major in power systems from Instituto Superior Técnico at Technical University of Lisbon in Portugal, obtained his MBA from Durham University Business School in the UK and a MPhil in Economics and Management from Solvay Business School at Université Libre de Bruxelles in Belgium.



### Solomone Fifita, Manager, Pacific Centre for Renewable Energy and Energy Efficiency, Tonga

He has served as the Head of the Pacific's Regional Energy Programme, housed at the Economic Development Division of the Pacific Community in Suva, Fiji. He has been a Project Manager for regional energy and climate change projects for the Pacific Islands and prior to that he was the Energy Planner for the Kingdom of Tonga. Solomone was a lead author in the IPCC Special Report on Renewable Energy, the IPCC 5<sup>th</sup> Assessment Report and currently in the IPCC special Report on the 1.5°C mitigation pathway. He has served as a Lead Reviewer of National Communications for the UNFCCC. Solomone has more than 25 years in the energy sector of the Pacific Islands.



### Martin Garrod – Principal Development Manager, NZ MFAT

Martin Garrod is Principal Development Manager, Energy, for New Zealand's Aid Programme at New Zealand's Ministry of Foreign Affairs. He has been at MFAT for 4 years and before that was at NZ's Energy Efficiency and Conservation Authority for 7 years. He has worked in renewable energy for over 15 years after gaining a Master's Degree in Renewable Energy Systems and Technology from the University of Loughborough in the UK and working for wind and biomass development companies there before emigrating to NZ in 2007.



### Jane Romero – PRIF Coordination Office, Sydney

Jane is a Technical Assistance Officer at the Pacific Region Infrastructure Facility (PRIF) Coordination Office, based in Sydney. She has an engineering background and has worked in various sectors, mostly in Southeast Asia. While working at the Institute for Global Environmental Strategies in Japan, she was part of several research projects that looked at trends in renewable energy policy in ASEAN, drafted guidelines for sustainable use of bioenergy in the region, provided capacity training to access climate finance to promote renewable energy, and supervised energy efficiency pilot projects in Viet Nam. Currently, at PRIF, she manages TA projects focused on improving the energy, transport and building sectors in the Pacific region.



### Peter Storey – PFAN Global Coordinator

Peter Storey is a financing professional, specialized in developing countries and transition economies with significant expertise in renewable energy as well as other infrastructure sectors. He has held senior positions with major European banks and project developers and has over 20 years of experience of working on multi-disciplinary advisory and financing mandates and of structuring and developing projects. Peter is a Global Coordinator of the Private Financing Advisory Network (PFAN). PFAN is a multi-lateral public private partnership which connects Clean Energy projects with investment in developing countries.





## SPEAKER BIOS

### Brian Clayton – Partner, Chapman Tripp Law Firm

Brian is based in Auckland, New Zealand, where he heads-up Chapman Tripp's Construction & Major Projects team.

He was formerly a partner at US law firm, Shearman & Sterling, where he worked in the Project Development and Finance team based in London and then Abu Dhabi.

Brian has worked on major projects worth around \$100b across many different sectors and geographies, including the Pacific, Asia, the Middle East, Africa and Europe.

A large part of Brian's practice is dedicated to power projects, including renewable projects in the solar, hydro, wind and geothermal sectors.

Recent power deals that Brian has worked on in the Pacific include the Tina River Hydro Project in the Solomon Islands and a solar programme in Tonga. Brian also does a considerable amount of projects work for Mercury Energy in New Zealand, which is a major generator of hydro and geothermal power.



### Jack Whelan, Secretariat Manager, Pacific Region Infrastructure Facility (PRIF)

Senior executive with over 30 years' experience in international development policy and advocacy in the fields of responsible business, clean energy, sustainable agriculture and environmental management. Focused on the Asia-Pacific region since 2008; currently with the Pacific Region Infrastructure Facility, a partnership to support donor coordination, technical assistance and research, based at the Pacific regional office of the Asian Development Bank (ADB) in Sydney.

Previous senior international leadership positions including with the International Chamber of Commerce, The Prince of Wales International Business Leaders Forum, the Foundation for Development Cooperation, the Asia Foundation, and the International Fertilizer Industry Association.



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