



# 3rd Pacific Energy Investors Forum

Exploring Private Sector Opportunities  
in the Pacific Energy Markets

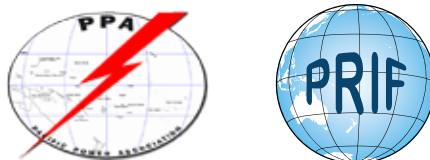
August 2018

*Organised in cooperation with*



Global  
Green Growth  
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.

This report is published by PPA and PRIF. The views expressed are those of the author and contributors, and do not necessarily reflect the views and policies of ADB, its Board of Governors, the governments they represent or any of the PRIF member agencies. Furthermore, the above parties neither guarantee the accuracy of the data included in this publication, nor do they accept responsibility for any consequence of their application. The use of information contained in this report is encouraged, with appropriate acknowledgement. The report may only be reproduced with the permission of both the PRIF Coordination Office and the Pacific Power Association on behalf of their members.

For further information, please contact:

**Pacific Power Association**

Naibati House  
Goodenough Street  
Suva, Fiji

Tel: +679 3306 022  
Email: [ppa@ppa.org.fj](mailto:ppa@ppa.org.fj)  
Website: [www.ppa.org.fj](http://www.ppa.org.fj)

**PRIF Coordination Office**

c/- Asian Development Bank  
Level 20, 45 Clarence Street  
Sydney, New South Wales, Australia, 2000

Tel: +61 2 8270 9444  
Email: [enquiries@theprif.org](mailto:enquiries@theprif.org)  
Website: [www.theprif.org](http://www.theprif.org)



## Contents

---

<b>Executive Summary</b>	<b>-----ii</b>
<b>Introduction</b>	<b>----- 1</b>
<b>Opportunities for Private Sector Engagement in the Pacific</b>	<b>----- 5</b>
<b>Technology Choices and Market Drivers</b>	<b>----- 7</b>
<b>Financing Renewables</b>	<b>----- 9</b>
<b>IPP Engagement in the Pacific</b>	<b>-----11</b>
<b>Recommendations</b>	<b>-----13</b>
Cook Islands	----- 16
Republic of Fiji	----- 18
Papua New Guinea	-----21
Samoa	-----24
Solomon Islands	-----27
Tonga	-----31
<b>Useful Reference Resources</b>	<b>-----33</b>
<b>Abbreviations</b>	<b>-----34</b>

## Executive Summary

---

### **This report has been prepared to provide a background to the private sector opportunities within the electricity sector across the Pacific.**

The work 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 to be held in Palau from 30<sup>th</sup> July to 3<sup>rd</sup> August 2018. The Forum is being 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 has 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 has been included to provide relevant and hopefully useful information for those looking to understand the market and/or expand their activities.

This report highlights 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 is 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 is 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. It is hoped that the Forum will allow open discussion on generation planning, funding and financing, the successful structuring of IPP projects and the timing of upcoming proposals for these projects.



# Introduction

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

PRIF has been working with the Pacific Power Association (PPA) as it prepares for its annual conference to be held in Palau, where the findings of this work will be presented.

Dr Mike Allen, the consultant, has 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.

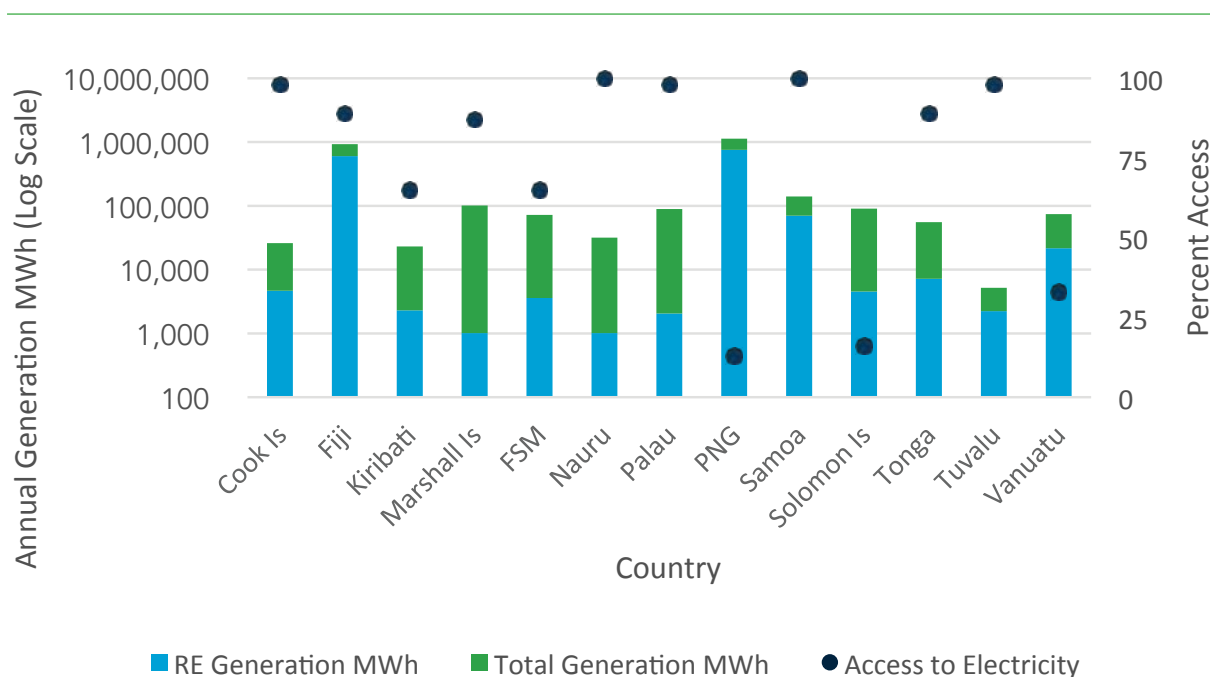


Approximately 26% of all installed generation capacity in the Pacific is currently renewable energy based.

## 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**

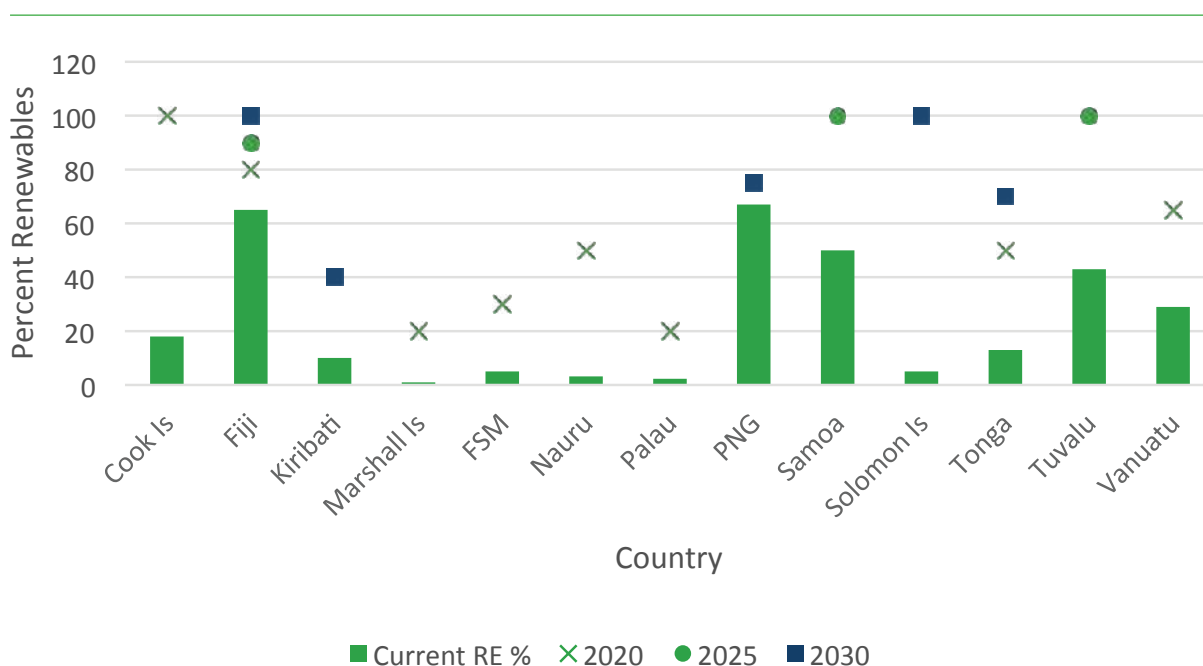


Figure 2 highlights the current situation across the Pacific. It illustrates the level of renewables that are already in place and indicates the targets that countries have under their NDCs.

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.

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

2 The Pacific Energy Country Profiles – NZMFAT 2016



# Opportunities for Private Sector Engagement in the Pacific

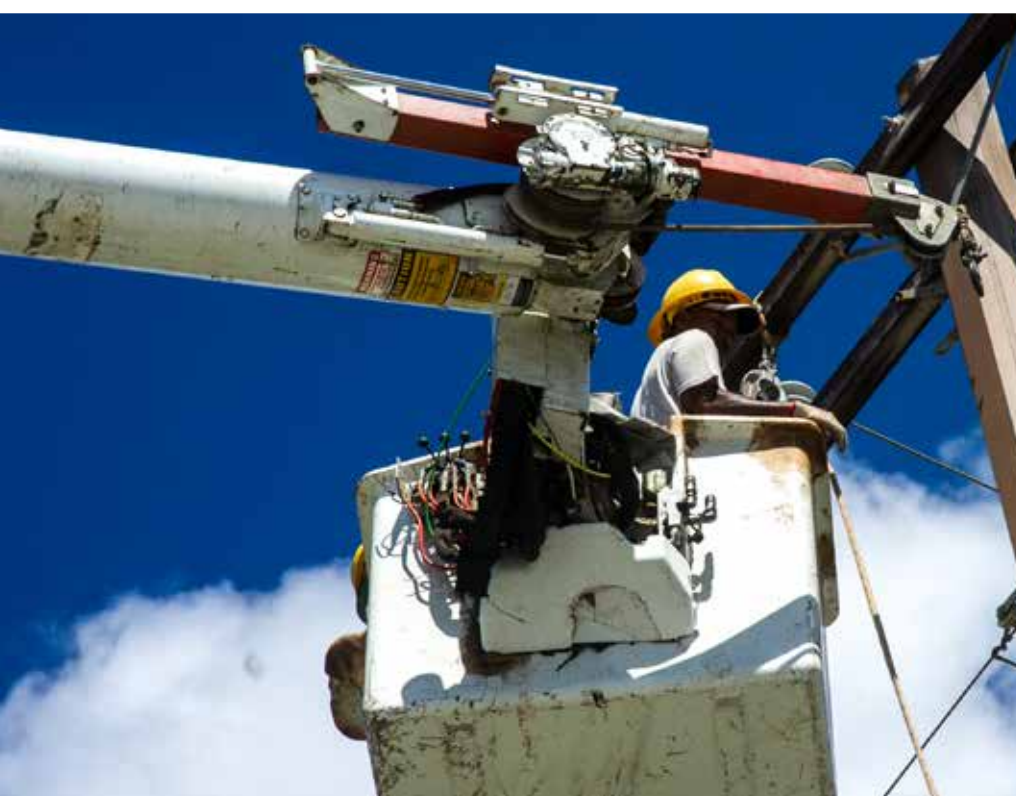
**It is clear that there is considerable activity across the Pacific within the electricity market.**

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



... with an existing portfolio of around US\$400m spread across 14 projects, ADB 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.

## 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.

## 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.



## 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.

## Financing Renewables

**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.



## 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.



## IPP Engagement in the Pacific

### **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.

## 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.

## Recommendations

---

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

In preparing this report and gathering background data and information a number of points have been highlighted. The Forum will provide an opportunity to debate some the issues that have been identified so that a coherent, collective set of recommendations can be presented in the final report to PPA. These recommendations should then be considered in structuring future forums.

### **The Role of the Pacific Power Association**

The PPA provides a clear focal point for the power industry in the Pacific. It appears to be seen as a valuable facility for the exchange of experience amongst members and the annual performance benchmarking provides a unique source of industry information. With the growth in renewables and engagement with the private sector, there are opportunities for the benefits of the exchanges across the membership to be applied in these areas, and others that will emerge as the market matures.

While several countries are building a portfolio of renewables and IPP interventions, others are yet to get heavily involved. There are a variety of training programmes being run in the region. There should be an increased contribution from those who have real regional experience and attention should be paid to considering what approaches, financing, project structuring and implementation are the most appropriate for use in the Pacific markets. The PPA could be more actively involved in these programmes.

The PPA has an important leadership role to continue to fill.

### **Attracting the Private Sector**

The small national energy markets and the dispersed nature of the Pacific islands themselves present challenges which are obvious to all. While preserving an appropriate level of competition, some thought needs to be applied to how market opportunities for individual private sector entrants might be enhanced and built in scale. Larger companies, which have the financial resources to underwrite IPP investments, may find single market activities too small to be attractive. National companies may have strong interests in building their local market share but lack the equity to enter into IPP operations. How can these interests be balanced or approached through possible joint ventures or other collaboration? The role of the utility as a possible “EPC” supplier and O&M provider, using its local knowledge and capabilities, could be offered to IPP interests?

### **Future Investor Forums – Structure and Location**

The first two forums, in 2014 and 2016, presented a number of potential project opportunities. The market was less mature and a number of the promoted developments did not in the end come to market; some are still under consideration. With the maturing of the market, procurement being more structured, and with fewer unsolicited offers being considered, the focus of the forum may need to be adjusted.

The current review suggests that there is a natural slowdown in immediate new tenders for generation as energy storage facilities are installed. This doesn't detract from the longer-term market potential in the region, in fact it is an essential element for future growth.



The real value for any forum is for suppliers, investors and developers to gain current information on market conditions and opportunities. Direct access to utility senior management is invaluable.

The location of the forum is therefore important to help ensure that it attracts the largest number of credible and interested parties to participate. The PPA Conference is designed for members and affiliate members; for others the length of the PPA conference and its location may not be quite so attractive or convenient.

An option would be to hold the Investor Forum separately from the PPA conference. One suggestion is that it could be held alongside the annual Asia Clean Energy Forum, hosted by ADB in Manila. This year over 1200 attended, including senior representatives from more than 12 PPA member countries. The ACEF has developed into a forum in which there are many technical sessions but also opportunities for entrepreneurs and investors to interact. It could be a practical option in terms of location, the nature of the sessions and the presence of funders and investors?





## 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.**

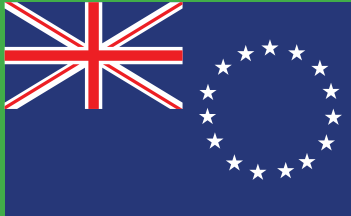
Where the focus is on solar PV, there are plans for expansion in most systems. The rate of this expansion is often now being dictated by when utilities will have adequate storage capacity in their systems to accept additional intermittent generation. Experience from Cook Islands, Samoa and Tonga provides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

### 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 discussion 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 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>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
<b>Under Consideration</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	

## 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>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
<b>Under Consideration</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

## 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>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
<b>Under Consideration</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	



## 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

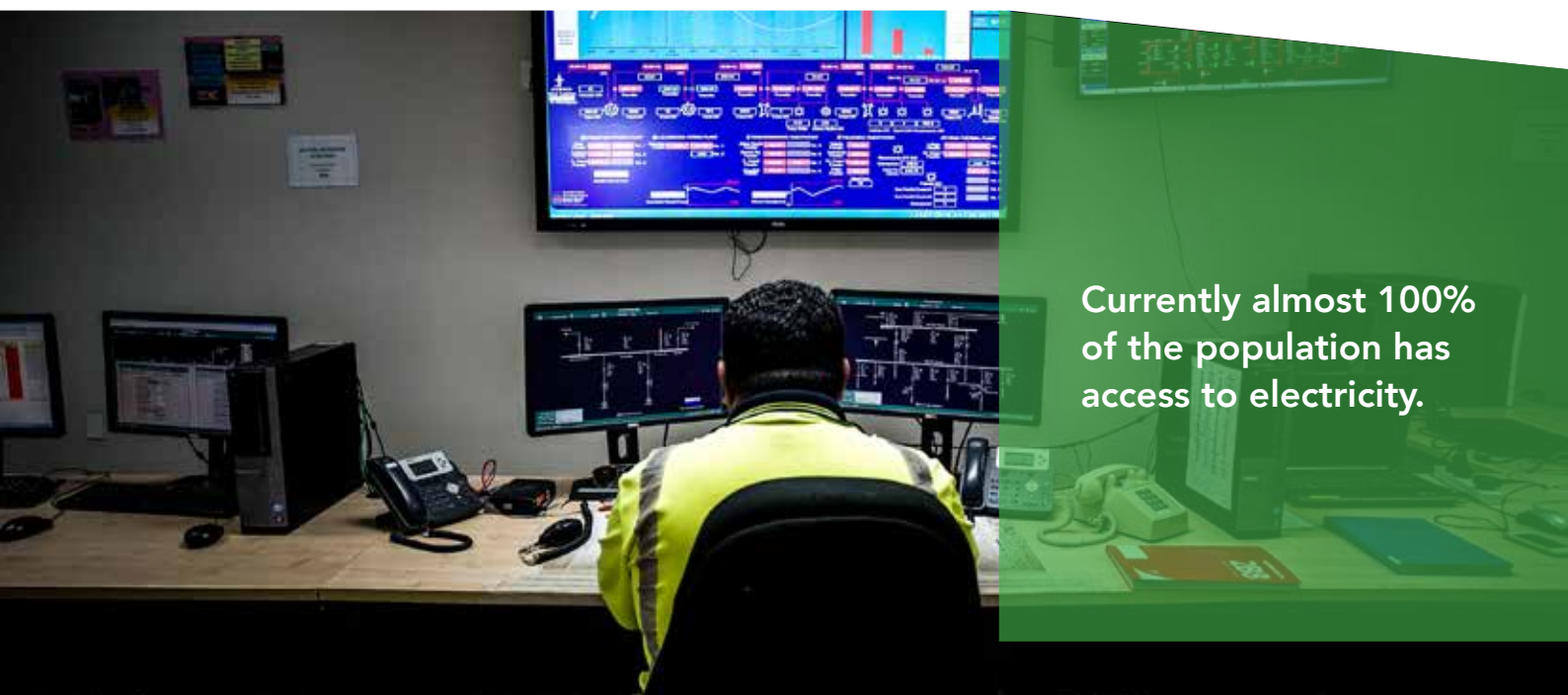
### Capacity

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

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

Project	Location	Province	Technology	Short description	Capacity (MW)	Year
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
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



## 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.

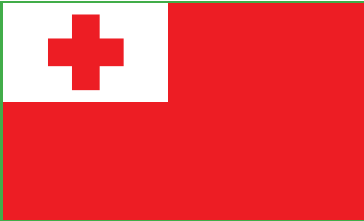
### Financial Performance

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>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
<b>Under Consideration</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

## 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 Niuaatoputapu 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 GDP 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

---

**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

---

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





**Pacific Power Association**

Naibati House  
Goodenough Street  
Suva, Fiji

Tel: +679 3306 022  
Email: [ppa@ppa.org.fj](mailto:ppa@ppa.org.fj)  
Website: [www.ppa.org.fj](http://www.ppa.org.fj)



**PRIF Coordination Office**

c/- Asian Development Bank  
Level 20, 45 Clarence Street  
Sydney, New South Wales, Australia, 2000

Tel: +61 2 8270 9444  
Email: [enquiries@theprif.org](mailto:enquiries@theprif.org)  
Website: [www.theprif.org](http://www.theprif.org)

*Organised in cooperation with*



Global  
Green Growth  
Institute

