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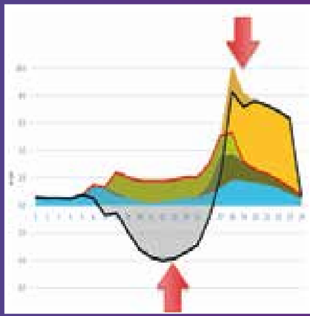

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Pacific Power Association, Suva, Fiji Islands. The PPA is an inter-governmental agency and member of the Council of Regional Organisations in the Pacific (CROP) established to promote the direct cooperation of the Pacific Island Power Utilities in technical training, exchange of information, sharing of senior managment and engineering expertise and other activities of benefit to the members.

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Cover Page Photograph – "Te Mana O Te Ra Rarotonga Airport Solar Power Project"

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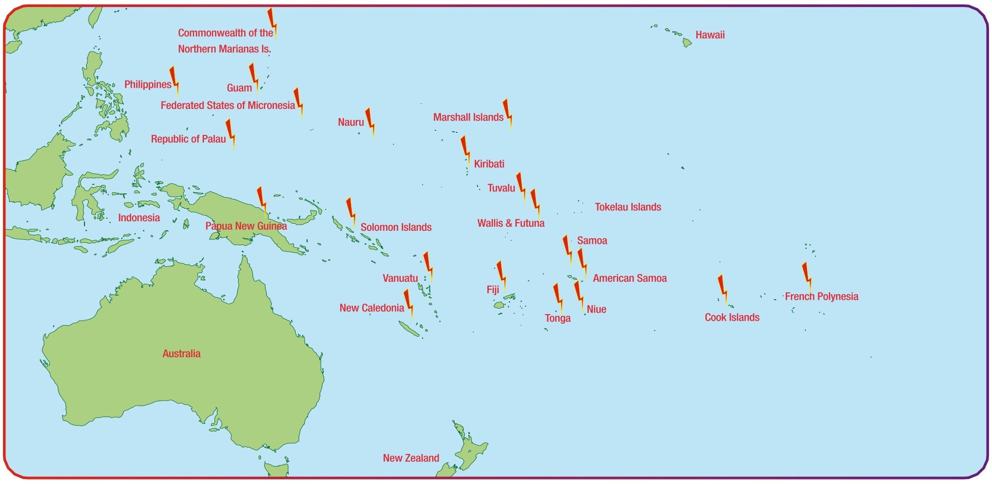

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Editor's Notes

Andrew D. Daka
Executive Director

Greetings from Suva.

With the PPA's 28th Annual Conference just around the corner, it is that time of the year again when members of the Pacific Power Association gather to discuss matters relating to the industry, the latest equipment and technology and current trend in the industry.

It is an opportunity for Allied Members to showcase their latest products, utilities to share experience and for development partners to inform the utility and government representatives of the offerings which countries can benefit from.

With the "push" for higher renewable contribution from energy generation in the islands energy mix, the challenge of Renewable Energy on the island grid is one that the utilities are gradually getting more experienced in dealing with. Based on current examples that we see within the PPA membership, for instance in Yap, in the FSM States, Renewable Energy Transition, the use of enabling through the technology such as SCADA and Demand Response is working very well for the utility.

May I on behalf of the Association also welcome the new Allied Members who have recently joined the Association; Texas Power & Associates, Japan Electric Power Information Centre (JEPIC), Engine Supplies & Services Limited, CCME Marine Engineering – Power Generation, Intracor Commodity Exports Ltd, EIF International Ltd, The Institute for Environmental Analytics and Tekconnec Inc.

Wishing all safe travels to Rarotonga and see you all shortly.

Vinaka Vakalevu.

Renewables are our Future
Yap State Renewable Energy Transition in Partnership with ADB, WB and FSM

Dean Haley
Team Leader - Entura

Beyond the typical images of blue water, white sand and sunny days, many Pacific islands are becoming visions of renewable energy innovation.

For remote off-grid communities with abundant sun and wind, such as Pacific islands, hybrid renewable energy systems offer exciting potential for achieving sustainable, secure and affordable power supply. Governments and utilities across the Pacific are embracing opportunities to harness the power of nature and lessen reliance on expensive and emissions-intensive diesel fuel.

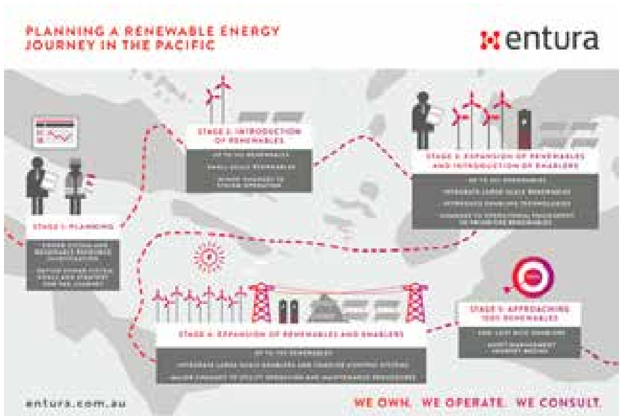
At first glance, this picture looks perfect. But it isn't simple. Off the grid, the impact of the intermittent nature of renewable energy is magnified. As the proportion of renewable energy in the power system increases, so does the need for enabling and supportive technologies to stabilise the power system while maximising the use of the sun and wind. This calls for innovation and integration.

A leading example of an advanced hybrid renewable power system has been completed on Yap, in the Federated States of Micronesia. It's an inspiring example of innovative deployment of hybrid renewables to increase the energy security and sustainability of an off-grid island.

Yap, like many remote and small island states, will benefit from a clean energy power system for three main reasons: to reduce heavy reliance on imported fossil fuels, to stimulate economic growth and social development, and to improve resilience during increasingly frequent and severe storm events.

After decades of operating on diesel fuel only, Yap's advanced hybrid renewable energy system is now enabling Yap to experience up to 70% instantaneous renewable penetration when conditions allow, with an average renewable contribution of 17%. It is delivering an annual fuel saving of up to US$500 000, and is designed to accommodate even more renewable energy generation into the future.

The journey towards a hybrid renewable energy system



Back in 2014, with funding from the Asian Development Bank, Entura helped the Yap State Public Service Corporation take early steps on a renewable energy journey. In addition the World Bank contributed funding for a third high-speed diesel that ensures system security, even during maintenance periods, as well as providing redundancy to cover future demand growth. Like many small island nations on the frontline of climate change, and facing the damage of shrinking coastlines and the ravages of tropical storms, Yap recognised the value of renewables in reducing diesel consumption, increasing resilience and economic viability, and offering lasting benefits to its community and environment.

The first stage of the process was determining the most appropriate hybrid diesel/renewable power system that would displace the greatest amount of diesel fuel within the project's budget and transform the manually operated 100% diesel power station into a flexible, integrated and automated power system incorporating wind, solar and diesel generation.

The power system was designed to meet the 2.2 MW load for the approximately 7000 people living on the main island, delivering up to 825 kW of wind energy from small but robust wind turbines and 300 kW of remotely controlled grid-connected solar energy from the rooftops of seven government buildings.

Entura provided owner's engineer services on site during construction and commissioning. In this stage, a new breed of high-renewable-supporting diesel generators were installed, and major works were carried out to install three 275 kW cyclone-proof wind turbines. As well, an island-wide communications network was installed, providing vital interconnection for the distributed solar PV and the wind turbines. This stage of the project also brought in the 'brains' of the system: a centralised control system.

The overall architecture of Yap's integrated renewable energy system, combined with the innovative automated integration and control system, balances and maintains the security of the energy supply, and also maximises the amount of renewable energy used on the island.

A future focus

With a strong focus on the future, the communications network and control system are designed to accommodate further integration of more renewable energy generation as required or desired. Entura is investigating the feasibility of including even more diversified, distributed, variable renewable energy generation to be incorporated into this system, including up to an extra 1.6 MW of ground-mounted solar, 1 MW of floating solar, 300 kW of roof-mounted solar, a 1.5 MW battery energy system, as well as the potential for another 825 kW of wind power (depending on land-owner negotiations).

As well as being designed to be able to realise future goals of operating at zero diesel, Yap's power system is also intended to be able to be operated and maintained within the community rather than by external specialists. The Yap State Public Service Corporation and Entura are working together to develop capacity within the Yap community, so that the local people will not only own the new state-of-the-art energy system, but will also have the opportunity to develop the skills needed to operate and maintain it into the future. Local power authority crews are now fully competent in solar system installation and maintenance, and have installed all the solar components of the scheme.

The results speak for themselves

Since the commissioning, no outage has been attributed to the introduction of the renewable energy facilities. The supervision and control system is performing as expected, curtailing renewable energy if necessary to keep stability and diesel generator(s) under minimum load. The dynamic spinning reserve plays its role and we can observe the small peak generator coming online when necessary. The system reached 60% of renewable energy penetration without any energy storage. Under particular conditions, the small peak generator connects and disconnects quite often, thus we look forward to the introduction of an energy storage system.

At the time of this presentation in July 2018 the wind farm has produced 602 MWh. The solar farms (ABD project only, PEC excluded) have produced 264.167 MWh since their installation. Approximate diesel displacement so far is 866 167 kWh / 14 = 61 869 US gallons @ $US3.9/gallon – $US241 3000.

Diesel displacement in non-wind periods (ie solar only) is 264 167 kWh / 14 = 18 869 US gallons.

Ingredients for success

The keys to success are acceptance, resilience and preparation for disruption.

For Yap, access to reliable, affordable and sustainable modern energy is an important step towards lasting social and economic benefits for the local community, as well as better protection of the beautiful but fragile natural environment.

This example of effectively integrating existing and new technologies to create a secure clean energy system is at the forefront of world's best practice. The success of the project has obvious application for remote, off-grid or island communities worldwide – but the strength of the technologies and their integration and control are equally applicable to the creation of 'dispatchable' renewables at any scale.

If you would like to discuss how Entura can support your journey towards hybrid or dispatchable renewables, please contact Akhil Pai on +61 406 874 101 or James Mason on +61 400 603 650.

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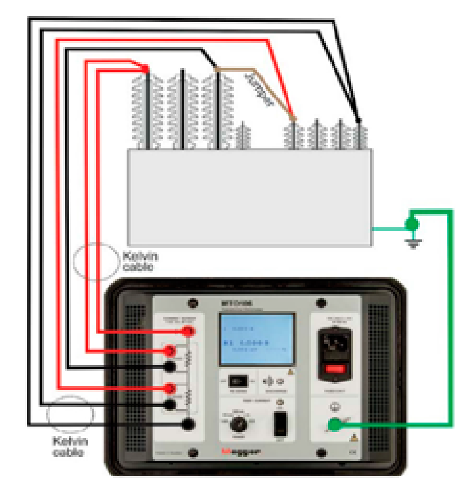

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Challenges for Renewable Energy Integration in the Pacific Island's Grids

Dr. Herb Wade
Consultant - Pacific Power Association

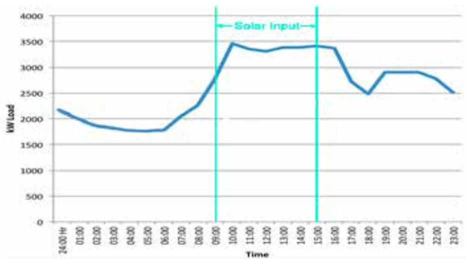
Although the integration of biomass/biofuel based generation, geothermal units and most hydro installations is not radically different from integrating a new diesel facility, integrating significant solar, wave, and wind energy into an island grid can be a challenge because of their unpredictable variability. In the case of solar an added issue is the fact that its availability is limited to around 8 or 9 hours each day with a strong peak at noon so that most of the energy is generated between 9 am and 3 pm. Since the wind resource is generally poor in the Pacific Islands and wave energy is still not a mainstream resource, the great majority of new renewable energy being integrated into the Pacific Island grids is from solar arrays.

Although the addition of large scale energy storage provides the simplest solution to the variability problem and is essential if there is the need to use solar generated power at night, its cost is high and most utilities in the Pacific are presently focusing on increasing the level of solar generation to the highest possible level before investing in large scale storage.

Adding solar increases the energy supply and provides income to the utility but adding storage just improves its usability and may even add some cost. So as long as adding more solar without storage can be done without causing the grid to become unstable, that is the preferred approach. The main challenge for most utilities now is therefore to maximize the solar with minimal or no investment in storage.

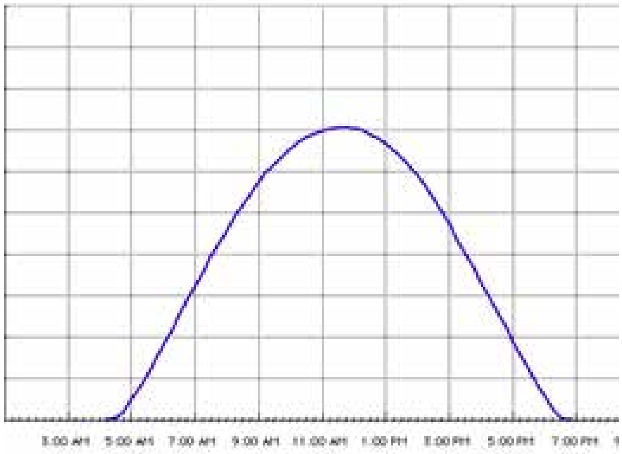
The good news is that most urbanized island grids have their peak loads during the day when the sun is shining (see figure 1 for an example of the load curve of an urban island) so solar energy can directly meet much of the load.

Figure 1: Noon time peak load – urban grid



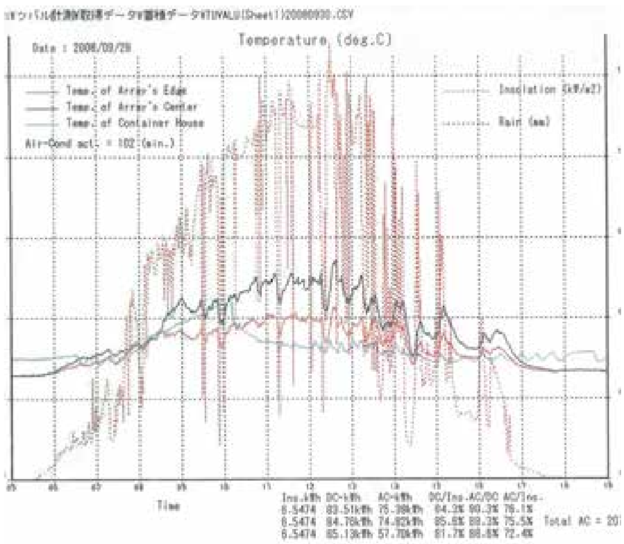
The bad news is that the solar is unpredictably variable due to clouds and cannot be counted on for generation. Very few days in the islands are completely clear so the "perfect" solar day of the deserts of the world that follows a generally predictable energy input, as in Figure 2 is rare.

Figure 2: A clear day in the dessert



Even what islanders call a "clear" day will still have a few cloud passages that cause sudden, rapid changes in solar availability as in Figure 3

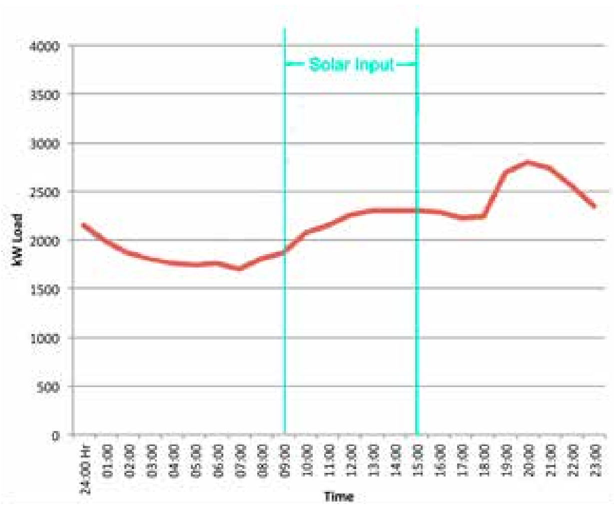
Figure 3: A typical "clear" day in the islands.



shows real data from a partly cloudy day in Tuvalu with a high level of variability of the solar input to the PV arrays on the island. Although there are some problems integrating the solar even on clear days, the solar output on a clear day is easy to manage and so is the solar output on cloudy days since the variability of the energy is low. The main problem days are those that are partly cloudy and variability of the solar input is high.

Unfortunately, residential peak loads tend to occur in the evening and too late in the day for solar to provide much benefit. So non-urban island grids (see Figure 5)

Figure 4: A partly cloudy Day in Tuvalu.



will not be able to use solar for a high percentage of total daily generation unless energy storage is included. The key issue is the load seen by the grid between about 11am and 1 pm when the solar generation will typically be at its maximum.

The diesel generators can usually manage to fill in the rapid changes in solar generation that occur with small amounts of PV generation, but, as the percentage of solar generation increases, there comes a point where the diesels simply cannot keep up with the large and rapid load changes that result from the variations in solar output. In general, once PV has the clear day capacity to provide more than 20% of the noon time generation, there is increasing worry that with more PV the diesels may be unable to keep up with the load changes that occur when there is a cloud passes over the solar. If that happens, the quality of power on the grid falls or, in the worst case, the system crashes.

Since most of the island governments have targets for much more than 20% of noon-time generation from solar, what can be done to increase the amount of solar generation beyond that 20% of the noon-time load without cloud caused variability causing serious problems with power quality and system stability? The most effective approach without adding storage is to disperse the solar generation around the island so that a cloud cannot shade all the solar panels at the same time. Since the problem is mostly the rapidity and amount of load variation seen by the diesels, if the PV generation is concentrated in one place a cloud passage will cause a very large and very rapid change in PV generation. However if the PV generation is dispersed, that same cloud will not be shading all the PV arrays at the same time so the rate of change and the depth of the change will be much less than that seen with the PV concentrated in one place. To illustrate, Figure 5

Figure 5: A large concentrated array on Rarotonga.

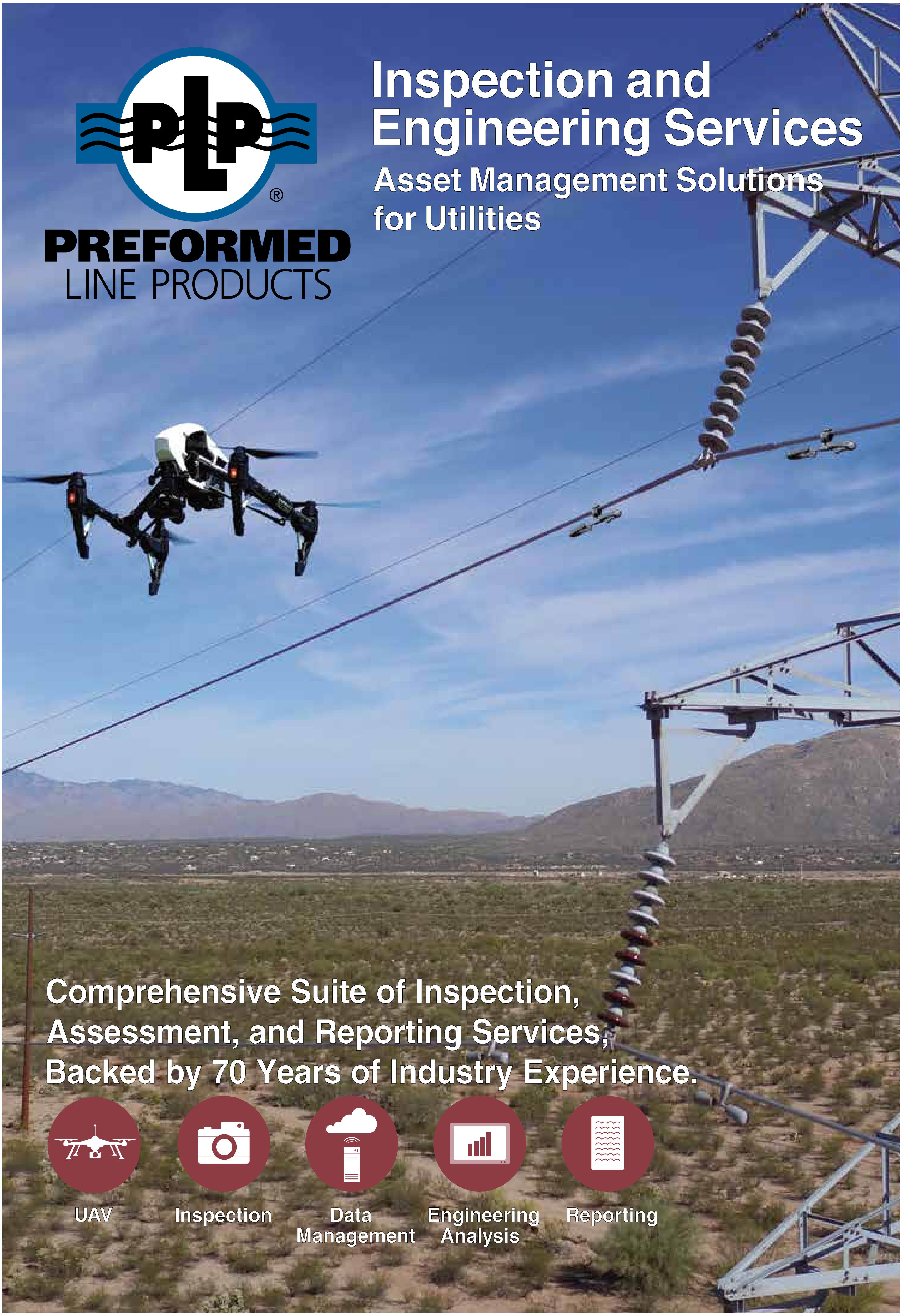
shows the PV dispersed around the island. With the dispersed approach, the total capacity of the PV generation can reach as much as 50% of the noon time load without problems with the diesels. The variations are slower and smaller and can be accommodated by the diesels. Also by dispersing the PV generation, there will be much less need for new transmission lines and transformers than would be the case if all the PV is concentrated in a single area.

Figure 6: Dispersed small arrays for Rarotonga.

Another approach that can reduce the rate and depth of the variability of the solar output is to have a significant percentage of the solar panels oriented in different directions. If a panel is tilted toward the east, it will have its daily peak output in the morning. If oriented toward the west, it will have its peak in the afternoon. A mix of panels facing in different directions will avoid the strong peak at noon and more closely match the load curve. It will also help reduce the depth of variability due to cloud passages. This is a practical approach in the tropics because there is little reduction in output from the solar panels that are not oriented exactly facing the equator at the optimum tilt. One benefit of using a large number of roof mounted solar arrays for generation is both the dispersion of PV generation sites that results but also the fact that roof orientations and slopes vary and having many roof mounted arrays helps deliver the total solar power more evenly over the day. If the majority of the solar generation to be installed on the grid will be in large arrays on the ground, consideration should be given to not following the usual plan of all panels facing the same "optimal" direction but to install a significant percentage of the panels tilted toward the east and west, not just facing the equator. Though there will be a small loss in total energy from the array, for tropical islands it will be on the order of a few percent and the resulting solar input will better fit the load curve and the relative depth of variations due to clouds will also be significantly reduced.

Even with widely dispersed and randomly oriented PV arrays, storage will usually be a requirement to maintain a stable grid for noon-time solar penetrations greater than 40% to 50%. If stability is the main issue, relatively modest amounts of storage can smooth the output from the solar sufficiently for the diesels to keep up with the variations in solar output. Super-capacitors are particularly good for smoothing the output of solar generators since they can charge and discharge very rapidly and have a very long life in that type of service. However, they are relatively costly and are not appropriate for long term or large scale energy storage. Since it is clear that large scale storage will be required if solar is to become the primary generation source, it probably will make economic sense to proceed with sufficient battery storage to both provide smoothing of PV power generation and to provide peak load power during cloudy periods. The design of the initial storage system should allow for its continued expansion so as the amount of installed PV increases, the storage can easily be increased proportionally.

To properly meet these challenges, planning is important. In particular adding PPA based private solar must be carefully considered since the utility will be contracting to purchase all generation from the solar IPP for many years whether the power is actually used by the utility or not. If curtailment of the IPP generated power is necessary to maintain grid stability, that can be costly. The addition of storage must also be carefully considered since there are typically 20% losses seen when charging batteries and then delivering the charge to the grid. Though in the early days of adding solar to the grid, its integration was not much of a problem, as the island utilities get closer and closer to their renewable energy targets, proper planning of the integration of solar generation, energy storage and diesel generation become increasingly important. Computer modeling of the utility system can be very helpful in figuring out what the best mix of solar energy, energy storage and diesel generation will need to be when the renewable energy goals are finally met. Once that is understood, planning the investments required to get to that point will be much easier.



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Implementing DRRI in Pacific Island Nations

Paul Nelsen
Vice President - Itron Australasia Pty Ltd

Background
Increasingly, Utilities are turning towards renewable and embedded generation for a range of reasons, stemming from a move away from fossil fuels through to building a cleaner environment. Island Nations have an additional reason to move to renewables in that in many case, the existing generation is produced through diesel generation, for which the fuel needs to be imported. The cost of this import, along with the supply chain required add considerable costs to generation which could be removed if a local and sustainable source of generation could be implemented.

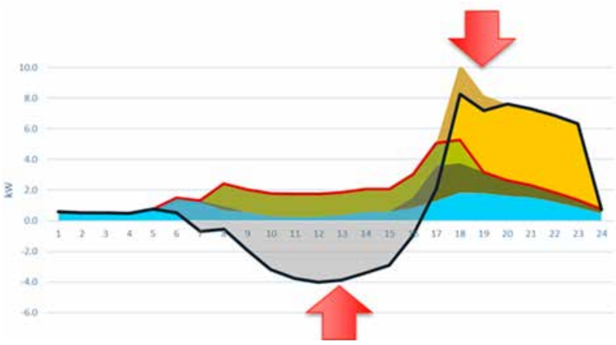
Working with the ADB and other agencies, over 2017 Island nations have over $250M worth of ongoing renewable projects with another $500M and some large Hydroelectric plant projects scheduled to commence. Fiji's 99% renewable target for 2030 underlines the importance and focus in driving forward island economies through renewable addition and adding security of supply to consumers.

While renewable energy brings forwards the opportunity for self-reliance, the chance for cheaper energy process also brings forth new challenges. In some economies, renewables will be a replacement for existing generation, while in other nations, like the Solomon Islands – renewable power will be the first time electrification has reached significant parts of the population. In either case, the traditional daily energy profile, stable for many years, is now changing though the cause varies by Country driven either by economic necessity, Consumer trends or local Government policies.

This trend is not simply limited to established and affluent economies. To offset the price of Petrol, the island of Barbados has implemented public electric vehicle and subsidies to reduce transportation costs over the island. EV's now amount to 4% of all sales as Consumers recognise the benefits and range anxiety is less of an issue on a constrained island – but results in an increased charging requirements peaking at the end of the day.

Likewise, in West Coast US, the tariff benefits for an Electric Vehicle have increased the penetration of EV's into certain Consumer segments. Charging for the EV's is focused into early evening timeslots as people return home at the end of the day and this gives rise to new peak demand being drawn at this time – changing the profile shape. Further changes follow, as Consumers endeavour to offset the additional power costs through the addition of relatively affordable solar power. While this may result in a net balance in financial costs for the Consumer, it creates a large imbalance in the Energy profile for the local Power Company with excess generation created in the day and excess Consumption at night.

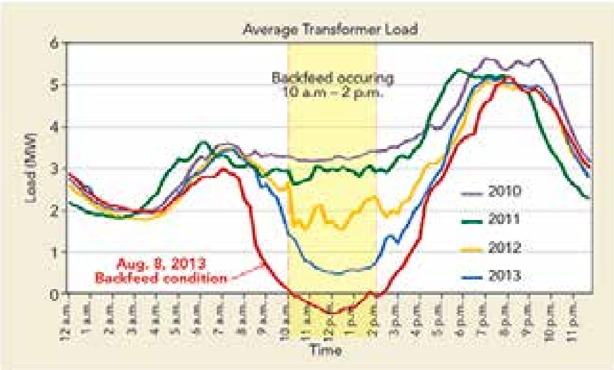
In this case, Solar is added as a reaction to new demand, but the opposite can also be seen where localities add Solar to create supply to drive economic growth - then finding that the first large spikes for demand are found where electricity is then used for lighting, cooking and activities in the evening period.



Solar added for Economic or Consumption offset reasons causes temporal Imbalances

The net effect is the same – an imbalance between the generation during the day and consumption during the night – with the onus to tackle the problem falling upon the Utility Company.

This effect is not new, where the, now famous, Hawaii "Duck curve" shape illustrating net over Consumption on some LV network segments gives rise to net export through the grid. This in turn gives rise to not just an issue between balancing supply and demand at different times of the day, but additional life-limiting stress to Transformers and the need for more Complex LV, and even MV control strategies.



Control is further complicated when one considers the need to take into account strategies to contend with sharp drops in generation caused by weather changes. Cloud cover can remove 85% of solar generation for a given site within minutes. If this power was relied upon and fully committed, the loss of generation could ultimately give rise to Voltage instability and ultimately local network failure.

While renewable Hydro-electric (where available) and diesel generation can be used to prop-up lowered generation capacity, a more sustainable solution needs to be found for both the new energy imbalance profile as well as managing short term instabilities.

Batteries would look to be the natural solution to the issue. Excess generation can be stored during the day, and dispatched during the evening peak periods to offset the increased demand. Likewise, should short term cloud cover reduce generation during the day, a battery discharge could limit generation drop. The issue in both cases though, is that current battery technologies are expensive with costs of $200 / kWh currently being experienced. While this is very much lower than the cost 5 years ago, the initial outlay of putting in significant amounts of storage is not yet economic for many Consumers or Utilities.

Accepting that batteries will never be the complete solution to the issue, even with $100 kWh expected by the end of 2020, Utilities need to find an alternative means to balance out both long and short scale imbalances between supply and demand – and this means managing the demand to ensure it can better match what power is available.

Demand Management is not new, having been used for many years through tariff structures. The aim of these have been to target the Consumer into limiting demand in response to very static price signals in the form of tariff bands. With the advent of new technologies though, the opportunities to manage demand more precisely is now available. Where once ripple control could control loads, the implementation of smart metering now provides the equivalent load limiting capabilities along with the added visibility of "seeing" what consumption is being used at any time. Immediate feedback then allows Utilities to see the effect of demand response signals to better plan further action during an event. The ability to coordinate dispatch of local generation (DERMS) adds an extra dimension and with intelligent control gives rise to the Virtual Power Plant, implemented through multiple smaller generation units.

Demand management can now not only suggest to Consumers how they can benefit through changes in their use of power, it can also actively interact with devices. With embedded generation, this coordination of both local supply as well as demand brings the possibility of taking control of the change in profile shape, rather than reacting solely to it.

Itron is involved in one such study to see how this control can be exercised to better make use of renewable generation. Faced with the rise of EVs and the threat of unconstrained evening charging, the Center for Sustainable Energy in California has commenced a pilot program to look at the different ways that Consumer Usage can be managed depending upon the available control devices within a home as well as the appliances used. The aim of the study is to determine a range of compatible strategies tailored to individuals, to migrate load without appreciably affecting lifestyle and to identify gaps for new technical innovation. The key difference between this study and previous ones is the recognition that what works for one Customer will not necessarily work for another. And, while Demand Response automation can be an answer, education and understanding on usage is equally important.

The study looks at a number of common behind the meter devices such as smart thermostats, heating, air-conditioner use as well as solar, EV charging and battery storage. The premise of the Study is that for every gross usage characteristic, there is one or more mitigation tactics to target peak imbalances, and recognising that every consumer is unique, the aim is to make the most optimal use of controlling the assets to then flatten and control the demand profile.

AC	PV	EV	Storage	Method of Control
✖	✖	✖	✖	Shift and flatten
✖	✖	✖		Reduce AC during peak, shift EV
✖	✖		✖	Reduce AC during peak, load shift with storage
✖	✖			Reduce AC during peak
✖		✖	✖	Shift EV, reduce AC during peak, storage to flatten
✖		✖		Shift EV, reduce AC during peak

For those Consumers with Battery Storage, the key control method is to shift demand through storage of power when excess is available, and dispatch to match the peak – effectively to flatten the profile. If the Consumer has embedded Solar, then this can be a local control to charge batteries during the day – but equally, charging from the grid can reduce the overall excess in times of high overall Solar generation – while curtailing this in times of cloud.

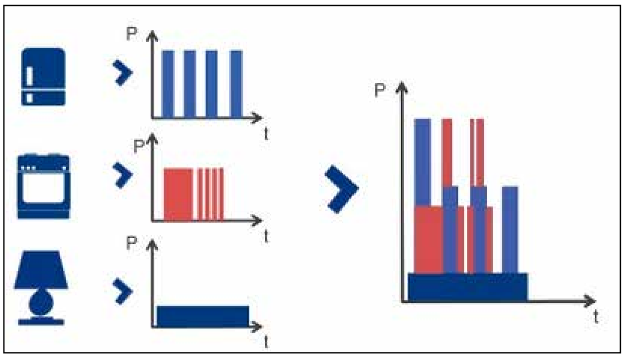
For those with EV or high use devices in a localised time slot (Dish washers, Water heaters, Machinery) the tactic is to control activation within a bigger time window to ensure that not all of the appliances within a geography are scheduled at the same time. Staggering their use within predefined, agreed time windows then provides the Utility with the ability to avoid sharp peaks in demand, while providing minimal impact to Consumer's lifestyles.

For Air Conditioning use, reducing consumption at peak times through minor changes in temperature settings or pre-cooling of environments can be used to limit coincident peaks and try to flatten out consumption.

Individual Consumer's circumstances form the fundamental building block upon which to tailor the response. To understand Consumer usage, every trial recipient is provided with a questionnaire to complete to identify these broad traits. Taken alongside Smart meter energy data this compiles an accurate view of each Consumer's usage as well as what devices may be "controllable". In this study, specific control devices are subsequently issued to homes and linked to a central DER system. Itron is supplying this central DER through its Intellisource product – which enables automation of scheduling and load limiting.

Identifying individual consumption patterns is the key here. While a questionnaire determines rough usage, it is far from accurate and does not take into account changing circumstances and usage. Initially successful plans would be expected to be less effective over time as Consumers change. Far better would be the ability to identify on an ongoing basis, the devices being used. That way monitoring of the success of any consumer education programmes can be done as well as to detect new devices being introduced and amending any strategy accordingly.

Load Disaggregation, or "Non-Intrusive Load Monitoring" (NILM) provides this capability, by monitoring the changes in consumption patterns. As each device is turned on and off within the home, the overall consumption (kW, kVar, V, phase angle, duration) changes by an amount directly related to the individual appliance. With a knowledge-base of possible electrical appliances, it is then possible to categorise what specific appliance is being turned on / off by monitoring the change in consumption and comparing against the database. For instance, pure resistive loads can be equated to heating and lighting while motors (such as Air conditioning, Washing machines) have an inductive element.



NILM has also been available for around 6 years now, though in the majority of cases, identifying more than the tope 3 or 4 devices in the home has necessitated the use of an additional smart home unit which can cost up to $600. It has thus stayed as a niche Consumer product. However, with the advent of Smart Metering, regular meters now have the capability to sample at higher frequencies (for instance 5 minute) and thus provide a profile that can be used. The issue for resolving individual appliances though, is the ability to detect each's individual signature. If you only sample at 5 minute intervals, the likelihood is that during the time between one monitoring point and the next more than one change has occurred, resulting in an aggregated consumption change that cannot be categorised or (worse still) is categorised incorrectly.

Moving to sampling at higher frequencies leads to greater accuracy, but if this data is being processed in a Utility's back-end Analytics gives rise to an exponential data volumes being retrieved with associated increased cost in communications and servers to process the data. The only way to cost-effectively conduct NILM is thus to conduct it in the meter using Distributed Intelligence.

Itron's Riva Meters possess Distributed Intelligence with Theft, and High Impedance detection "apps" now available to be deployed onto existing Riva meters. The "Load Disaggregation" application was launched at the Asia utility Week show in Bangkok in June. Using a combination of pattern matching of the on / off consumption changes as well as machine learning, the application samples changes in overall consumption in the meter at 1 second intervals to identify appliances which it reports periodically to the backend server. With minimal overhead in communications costs and no additional devices in the home, this then provides Utilities with a cost effective mechanism to determine appliance use to establish what loads are in play at any time, and the correct strategy for dealing with consumption imbalances caused by renewable integration.

Summary

Renewable Integration and a move to cleaner energy use is not simply about replacing one generation source with a second. The introduction of Solar, either at the micro level by individual Consumers or the macro level in large Solar farms, can, by nature only produce energy at a constrained time and is Weather dependant. Early recognition and identification of Consumer patterns is essential to the planning process, not only for new capacity, but how lifestyles and usage can be shaped from the outset, to avoid situations more established economies now find themselves faced with (The Hawaii duck). Consumers must be engaged in the journey and must be asked to play their role in assuring that there is enough energy across the day. Likewise, Utilities need to proactively incentivise, coerce and control Consumer load to make the maximum benefit from Renewables.

Pacific Power Association holds training on Power Purchase Agreements, Monday 1st April 2019, Nadi, Fiji Islands

Pacific Power Association

Participants at the Power Purchase Agreement Workshop organized by the Pacific Power Association.

The Pacific Islands will need private sector investment in the energy sector to increase the contribution of renewable energy to the islands energy mix, reducing dependence on fossil fuel and addressing climate change. A good understanding of Power Purchase Agreements which is the principal instrument binding the investor and the power purchaser goes a long way towards a successful public-private partnership.

The Pacific Power Association through its World Bank grant financed Sustainable Energy Industry Development Project (SEIDP) is conducting a weeklong training workshop on Power Purchase Agreements. The workshop is supported by the Pacific Islands Centre for Energy Efficiency and Renewable Energy (PICREE) hosted by SPC. Power Purchase Agreements set out the rules of engagement on the technical, financial and operational aspects for Independent Power Producers (IPPs) and electric utilities.

The participants taking part in the workshop are Chief Executive, Utility Board Directors, engineers, finance officers, electric utility regulators, legal and energy officials from Fiji, Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Samoa, Tonga, Tuvalu, Vanuatu and Cook Islands.

The training is in response to the members of the Pacific Power Association recognising the need to equip staff from its member utilities and other relevant stakeholders with knowledge and information to be able to evaluate and negotiate power purchase agreements that are beneficial to the utility customers and the private investor creating a win-win situation whilst also reducing our dependence on fossil fuels and addressing climate change.

Renewable Energy Investments in Pacific Island Countries

Maaike Gobel
Senior International Expert on Sustainable Investments & Financing - EU-TAF Pacific

While Asia-Pacific has - according to the UN - the world's fastest rising regional energy demand, Pacific Island Countries (PICs) rely heavily on imported fossil fuels, notably in the transport sector and electric generation industry. Diesel and heavy oil still account for most of the power generation in the region. Outdated power infrastructures, extreme climate conditions and numerous remote areas, add to the PICs energy challenge, as the region is also known for some of the highest electricity prices in the world.

ElectriFI, the Electrification Financing Initiative, has been established in 2016 with the purpose of providing early stage and high-risk financing for impact investment in sustainable energy. Launched at the 21st Conference of Parties to the UN Framework Convention on Climate Change, it was also acknowledged by the G7 Leaders' Declaration. ElectriFI is funded by the European Union and received contributions from Power Africa and the Government of Sweden. To date, ElectriFI manages a budget of €215million for a 10-year period, divided into a global window and 5 specific country windows in Benin, Cote d'Ivoire, Nigeria, Zambia and Asia-Pacific. Based on the current pipeline, expected results include 1.5 million direct and indirect connections or the equivalent of 7 million persons, with about 470 MW additional generation capacity and 430 GWh of electricity from renewable sources per year.

Taking the current energy security challenges faced by the Pacific Islands Countries into consideration, ElectriFI has dedicated some EUR 8 million to deal with market barriers and attract renewable energy investment in the region. By increasing power generation from renewable energy sources, its ambition is to contribute to a less polluting generation mix and bring economic and environmental benefits to both citizens and companies.

A market survey carried out by the EU Technical Assistance Facility showed the highest potential of opportunities are in smaller scale IPPs and captive power projects; such as medium-to-large solar installations at resorts, large commercial facilities and certain type of industrial facilities. Moving away from concessional finance will most probably be the main challenge to overcome, as to incentivise private investment which remain quite low in the region. Private companies have a prominent role to play in contributing to the expansion of renewable energy access and its positive cascading effects in poverty reduction, health, gender equality, education, environmental degradation, and agriculture.

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Welcome!

New Allied Members

Eight (8) new companies have joined PPA as Allied Members since our last PPA Magazine. The new members are:

TEXAS POWER & ASSOCIATES, LLC: Texas Power & Associates, LLC is based in Georgia, United States of America. Their primary activity is power generation. Their secondary activity is disaster relief.

JAPAN ELECTRIC POWER INFORMATION CENTER: Japan Electric Power Information Centre is based in Minato, Japan. Their primary activity is research about energy policies and electric power industries abroad. Their secondary activity is technical cooperation with developing countries to build their electric power infrastructure.

ENGINE SUPPLIES & SERVICES PTY LTD: Engine Supplies & Services Pty Ltd is based in Artarmon, Australia. Their primary activity is supply of generating sets, engines, spare parts & equipment for diesel and gas engines. Their secondary activity is plate heat exchanger spares, fuel & oil purifier spares, filter contracts.

CCME MARINE ENGINEERING POWER: CCME Marine Engineering Power is based in Queensland, Australia. Their primary activity is power generation diesel service and spare parts sales.

EIF INTERNATIONAL LIMITED: EIF International Limited is based in Auckland, New Zealand. Their primary activity is International Freight Forwarding.

INTRACOR COMMODITY EXPORTS LTD: Intracor Commodity Exports Ltd is based in Auckland, New Zealand. Their primary activity is electrical and all general materials supply. Their secondary activity is projects and tenders.

INSTITUTE FOR ENVIRONMENTAL ANALYTICS: Institute for Environmental Analytics is based in Berkshire, England. Their primary activity is renewable energy data modelling and software development. Their secondary activity is weather and climate risk assessments.

TEKCONNEC INC.: Tekconnec Inc. is based in Pago, American Samoa. Their primary activity is software development of prepaid platforms for power and Telecom companies. Their secondary activity is provide electronic pinless services to power companies for debit meter customers.