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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: "The PPA 30th Annual Conference and Trade Exhibition Engineers Workshop in Saipan, Northern Marianas, 2023"

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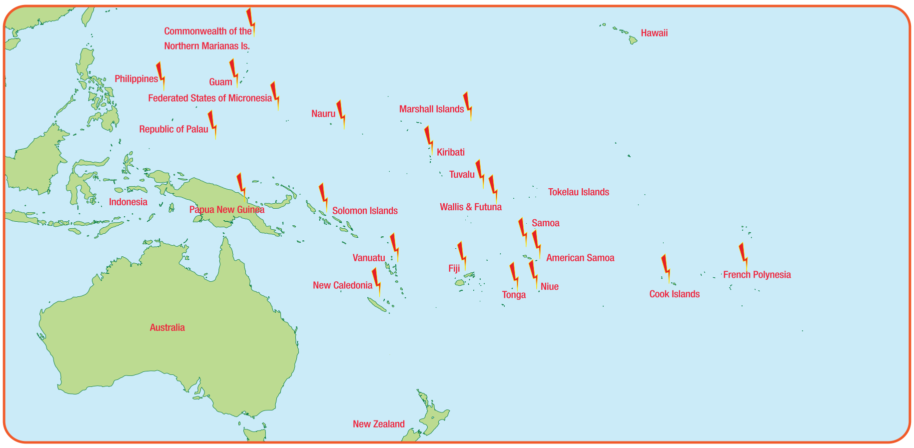

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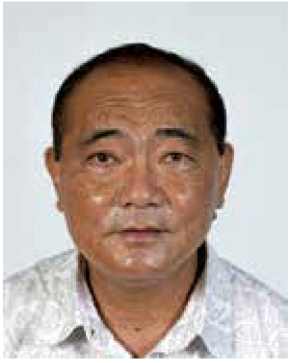


Editor's Note

Gordon Chang
Executive Director

This New Year has already started out with more challenges to overcome in 2024 for the PPA. Firstly the preparation for the 31st Annual PPA Conference to be held in Nuku'alofa, Tonga is under control and our host Tonga Power Limited who will be hosting their second PPA Conference will be looking to making this conference more constructive for our members.

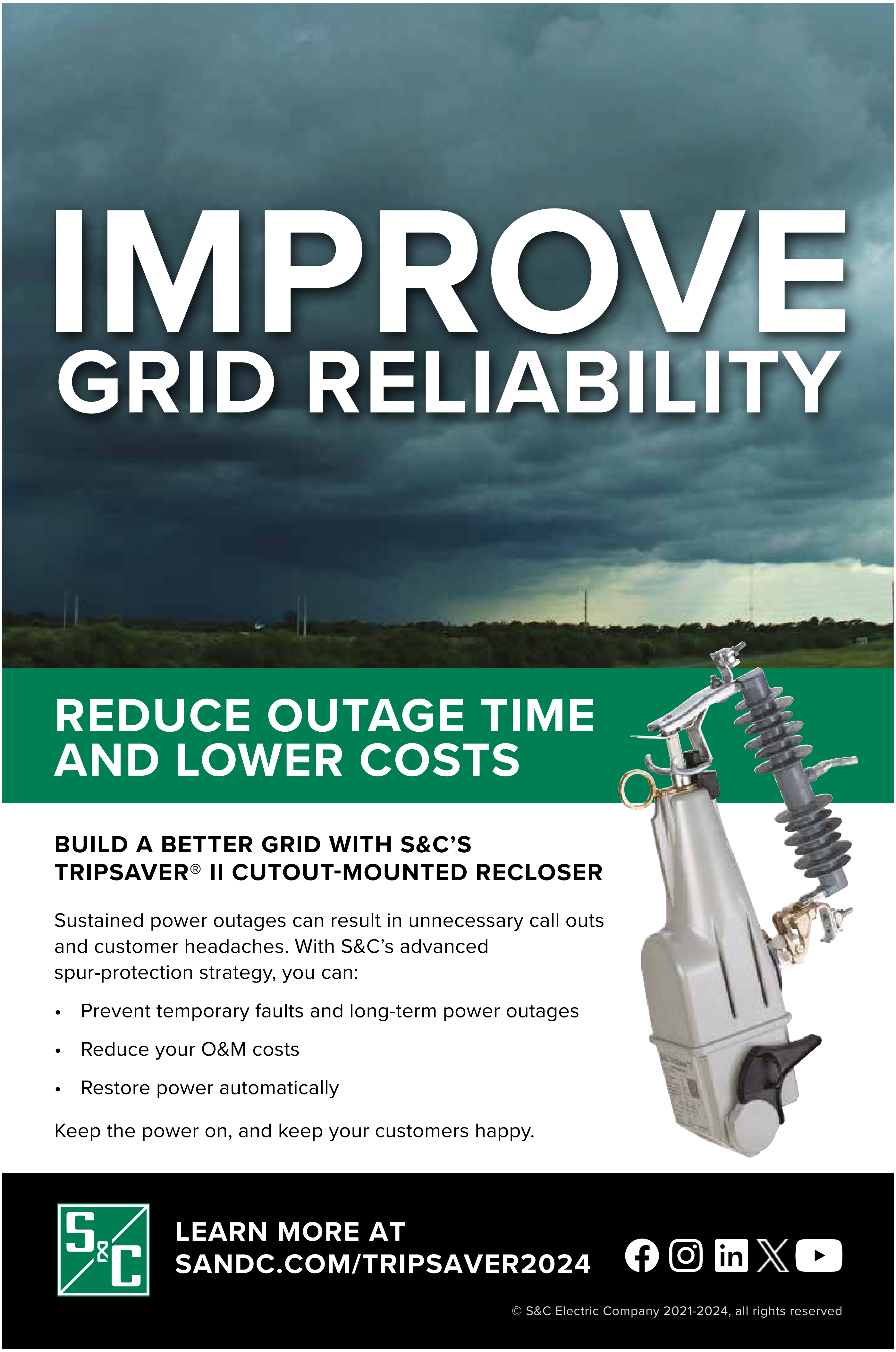
The accommodation and venue for the PPA conference have been selected with the conference information to be finalized and made available to our members on the PPA website. Once all these information have been finalized with the host utility The PPA secretariat will be advising members through an email that registration, reserving hotel accommodation and trade booths selection is now open to members. The host utility and the government of the Kingdon of Tonga is looking forward to the hosting of this year's Annual PPA Conference and they sincerely hope that all PPA members will make the effort to attend and make the conference in Tonga another success. This year the conference will be held from the 30 September to 3 October 2024 and the conference theme is "The Cost of Transition to Renewables." It is clear that the Conference Organizing Committee has been carrying out a great deal of hard work in addressing all aspects of the Conference, from transport arrangements and venues to menu selection. All attending delegates will have the opportunity to enjoy again all that Tonga has to offer. The PPA secretariat will be opening the "Call for Papers "soon and we hope that all members will promptly send in their paper presentations for approval in order to finalize the conference program in time for the conference.

I would also like to thank all those who have contributed articles included in this issue of the PPA Magazine.

Four (4) new Companies have joined the PPA as Allied Members since our last PPA Magazine. The new Allied Members are:

1. SUSTAINABLE ENERGY INDUSTRY ASSOCIATION OF THE PACIFIC ISLANDS:
2. SELECTRONIC AUSTRALIA PTY LTD:
3. GEOGAS PACIFIC PTY LTD:
4. VISION INVESTMENT LIMITED T/A VISION ENERGY SOLUTIONS:

Vinaka.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Tonga Renewable Energy Project

Adrien Nayan Bock, Pacific Director
Akuo Energy

Project Summary

Tonga Renewable Energy Project (TREP) is a $53,2 mUSD Donor funding program by The Asian Development Bank, Green Climate Fund, Australian Government, Government of Tonga and Tonga Power for:

- large BESS in Tongatapu
- electricity generation in the Outer Islands
- Grid Upgrade.

TREP1/ TONGA 1

- 10 MW / 5 MWh (30 min) installed
- Grid stability purpose
- 3 Storage GEM / 40-feet
- Internal inverters
- Contract: ~5 mnUSD (2019) (multi- currency)
- Client: Tonga Power Limited
- Funding Program: Tonga Renewable Energy Project
- Battery cells supplier: Samsung
- Inverters supplier: JEMA
- 5-year battery + PCS warranty (material & performance) • 540-day Defect Liability Period + 5-year extended DLP on battery and PCS

TREP2/ TONGA 2

- 7 MW / 24 MWh (3.5 hours) installed
- Load-shifting purpose
- 5 Storage GEM / 40-feet
- External inverters
- BESS substation
  - Contract: ~10.5 mnUSD (2019) (multi-currency)
  - Client: Tonga Power Limited
  - Funding Program: Tonga Renewable Energy Project
  - Battery cells supplier: Samsung
  - Inverters supplier: JEMA
  - 10-year battery + PCA warranty (material & performance)
  - 540-day Defect Liability Period

+ 5-year extended DLP on battery and PCS

THE FEAT – WHAT IS SO SPECIAL?

Many challenges were faced:

- Covid-19 hit during project execution:

=Tonga borders closed in March 2020... only re-opened one year ago! (Remote island & limited available skills)

-> Subcontractor couldn't send team to Tonga
-> Physical commissioning became impossible with mandatory quarantines (> 5 weeks)
-> Insurance became very tight, almost monopolistic market

- Volcanic explosion
- 12-hour time difference with Europe

Opportunities were seized:

- Client (TPL) executed some MV electrical works
- Remote commissionning of the 2 x BESS
  - Improved internal processes
  - Costs + margin approach agreed with Client
  - Soften contractual warranties
- Pass-through costs after Extension of Time
- Round-the clock work

AKUO and **Tonga Power Limited** delivered in 24 months (instead of 10 months)

- two technologicaly-complex projects (15.5 to 16.7 mnUSD in total)
- in a complex (remote, limited skills) and closed location
- with multiple price increases due to Covid-19 with positive gross margin for the Contractor

Thanks to:

The resilience, commitment and flexibility of the team.

The trust relationship and understanding built between Akuo, Tonga Power and ADB.

Challenges and Opportunities of Renewable Energy Projects: JCM and Energy Service Agreement Solutions

Renewable Energy and Overseas Business Department
Komaihaltec Inc.

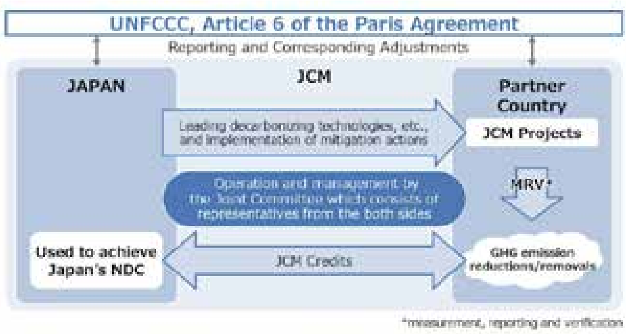
According to the world energy transition outlook, investments across energy transition technologies hit $1.8 trillion in 2023, up 17% on the previous year and a new record. However, fossil fuel remains the leading basis for energy. Considering impact of COVID-19, the energy crisis and regional political conflicts, many governments implemented short-term measures to secure energy supplies such as investments in fossil fuel infrastructure. Consequently, renewable energy investments remain concentrated in limited countries and focused on only a few technologies.

For the Pacific region the energy transition remains a big challenge as more than 50% of population lives in remote areas. In order to achieve the net zero emission goal by 2050, an optimal solution of financing and technology is crucial.

Picture 1. KWT300 Rotor Hub Installation

Practically, common funding sources for Renewable Energy Funds include government grants and subsidies, private sector investments, and international funding organizations. KOMAIHALTEC Inc., being a manufacturer of mid-sized wind turbines, has individual approach to its customers and our KWT300 wind turbine model with a rated capacity of 300kW is proven to be efficient in remote areas. Our KWT300 TCV, a typhoon-resistant turbine model, is designed to withstand the wind speeds of up to 91.26m/s and produce maximum energy within its capacity. As a supplier of equipment, Komaihaltec has its own approach, which includes feasibility studies, including consideration of financing mechanisms.

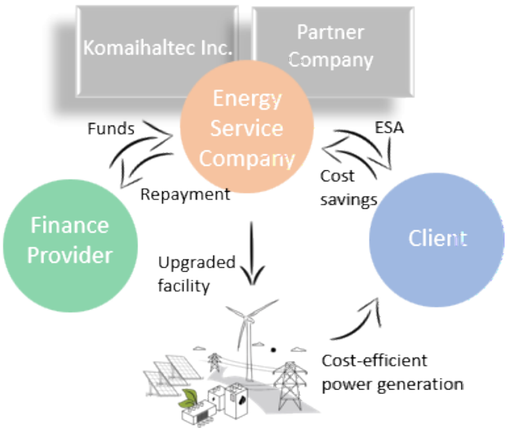
While there is a variety of widely-used forms of financing, recently the Japanese Government launched the Joint Crediting Mechanism (the "JCM") for the participants of partner-countries. The purpose of this program is the reduction of GHG emissions utilizing leading low carbon technologies in developing countries with which Japan has signed or has been consulting to sign bilateral document on the JCM, and also shall conduct the measurement, reporting and verification (MRV) of GHG emission reductions. The financing programme will finance part of an investment cost (up to the half), as premises for seeking to deliver JCM credits (at least half of issued credits) to government of Japan. As of January 2024, JCM partnership document is signed with 28 countries.



Source: https://www.jcm.go.jp/ (JCM official website)

Picture 2. JCM Model Project Mechanism Scheme

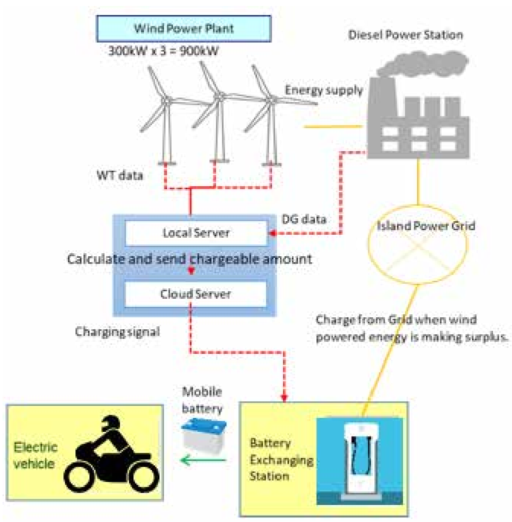
Another solution that recently is getting more and more attention is the Energy Service Agreement (ESA), a unique option for energy efficiency projects that allows the customer to pay gradually for the facility upgrade through efficiency. It's neither a loan nor a lease. Individual terms are determined by parties' agreement, but generally, the service provider pays for the upfront costs of the equipment and performs both routine and emergency maintenance, while the customer pays a fee on agreed terms each month, quarter or other term agreed based on energy efficiency economy after, for example, the facility upgrade from the energy efficiency achieved.



Picture 3. Sample ESA Implementation Scheme

Example 1. System for utilization of excess energy implemented in Romblon Island, Philippines

- Project Participants: Komaihaltec Inc., Honda Motor Co., Ltd., Romblon Electric Cooperatives
- System Components: 3 units of 300kW wind turbines (Komaihaltec)
- Mobile Power Packs and Charging station units
- Control system for charging surplus energy to battery packs
- Commissioning: February 2019
- Financing: The Ministry of the Environment of Japan, lease-term (monthly usage fee) agreement between Komaihaltec and local power company

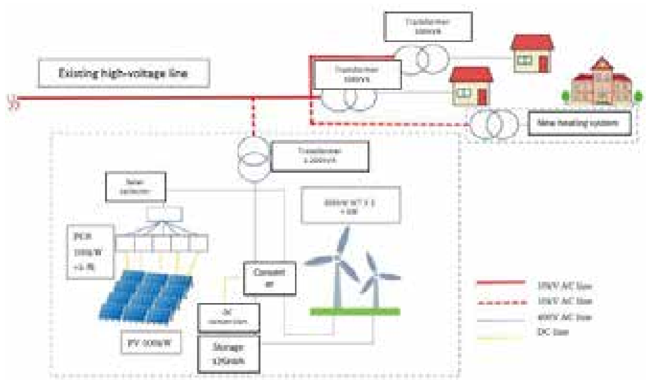


Picture 4. System Configuration for Example 1

KOMAIHALTEC Inc., having experience of system development for remote regions in different climate conditions, including typhoon climate zones, can propose a customized solution based on customer needs.

Example 2. System for mountainous area in Azerbaijan

- Project Status: pre-FS study under the Japanese Government funding
- System Components: 2 units of 300kW wind turbines (Komaihaltec), solar panels (500kW), storage batteries, heating system
- Output stabilizing technology demonstrated with storage batteries in Japan for effective utilization of renewable energy by balancing the entire power system, the system control of renewable energy generation, and the heating system using heat pumps.



Picture 5. System Configuration for Example 2

What Komaihaltec can offer to the Pacific?

Komaihatec Team can conduct joint studies and develop the best solution based on customer needs, design, supply and supervise during the entire project cycle, and provide post-implementation services such as consultations, maintenance services, etc. (See Picture 6. Project implementation flow)

Picture 6. Project implementation flow

Though we believe that the Pacific is a place where renewable energy makes good sense, an innovative approache is needed to address the challenging conditions and demands of the unique islands. Komaihaltec Inc. understanding those conditions, can propose a customized solution and support the customer in finding a way to clean energy generation.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Types of Inverters

Sustainable Energy Industry Association of the Pacific Island (SEIAPI) Newsletter

Types of Inverters

Within AS/NZS 4777 there are two definitions:

Inverter: A device that uses semiconductor devices to transfer power between a d.c. source(s) or load and an a.c. source(s) or load.

Multiple mode inverter (MMI): An inverter that operates in more than one mode. For example, having grid-interactive functionality when grid voltage is present, and stand-alone functionality when the grid is de-energized or disconnected.

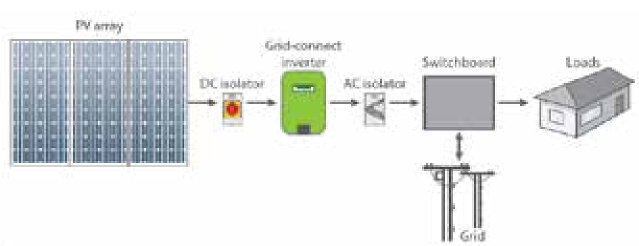
The problem is that though there are two definitions, there are still many types of inverters based on the differences in the operating functions of the inverter.

There are six main types of inverters on the market that could be used in a BESS that is coupled to a grid connected PV system. These are: PV grid connect, PV battery grid connect inverter, battery grid connect inverter, stand-alone inverter, inverter/charger and interactive inverter/charger. (A minimum of 1 inverter is required for a BESS system to operate as battery systems produce d.c. electricity, and typical household appliances use a.c. electricity.

Note: The term battery inverter is used here when the inverter input is connected to the battery system.

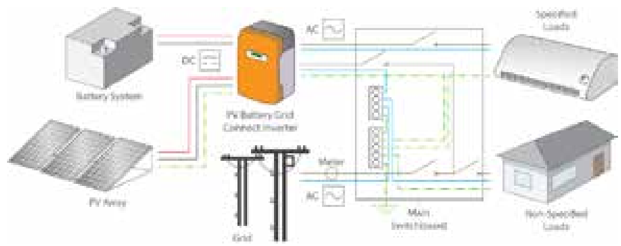
1.1. PV Grid Connect Inverter

A PV grid connect inverter has a PV inlet port and an a.c. port for interconnecting with the grid. The inverter is capable of producing an a.c. output that can interact with the grid. It cannot independently produce a.c. output as it requires a reference to a.c. power (typically the grid or another a.c. source). Therefore, a PV array cannot power loads via a PV grid connect inverter without additional equipment. They typically contain an MPPT for controlling the PV array output.



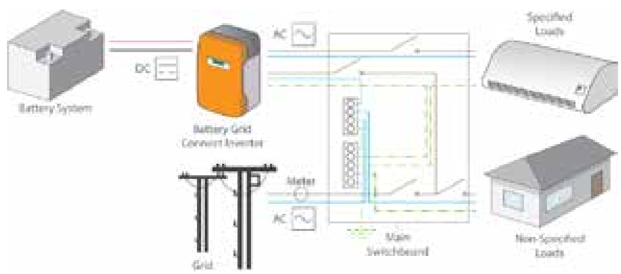
1.2. PV Battery Grid Connect Inverter

A PV battery grid connect inverter (hybrid) has both a PV inlet port and a battery system inlet port. It has an a.c. port for interconnecting with the grid and an a.c. outlet port for dedicated (specified) loads. Hence it is capable of operating with or without the grid. The multimode ability is required for the system to operate during certain conditions such as grid failures, or to offset peak loads. When it operates in this mode, the inverter isolates from the grid, and is often configured so it can still supply specified loads. When the battery system requires charging the inverter would switch into a battery charger to use the grid power to charge the battery system. The inverter would not provide power onto the a.c. input terminal when the grid is not available. That is, it has an anti-islanding protection.



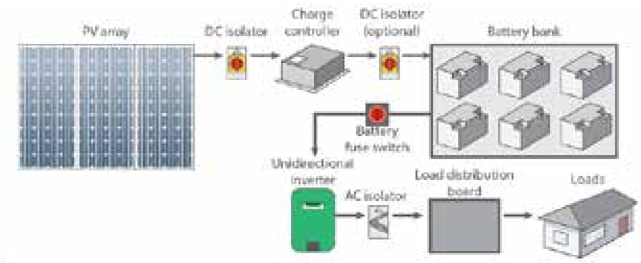
1.3. Battery Grid Connect Inverter

A battery grid connect inverter has a battery system inlet port. It has an a.c. port for interconnecting with the grid and an a.c outlet port for dedicated (specified) loads. It is able to synchronise with the grid and it can independently produce a.c. output if there is no grid. Hence it is capable of operating with or without the grid. The multimode ability is required for the system to operate during certain conditions such as grid failures, or to offset peak loads. When it operates in this mode, the inverter isolates from the grid, and is often configured so it can still supply specified loads. When the battery system requires charging, the inverter would switch into a battery charger to use the grid power to charge the battery system. The inverter would not provide power onto the a.c. input terminal when the grid is not available. That is, it has an anti-islanding protection.



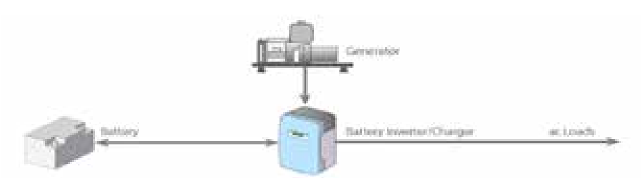
1.4. Stand-Alone Inverter

A stand-alone inverter has a battery system port and an a.c. outlet port. The stand-alone inverter is designed to provide a.c. power from the battery system which are typically charged by renewable energy sources. These stand-alone inverters are not designed to connect inverter output power onto the a.c. input terminal and therefore cannot inject power into the electricity grid. They can only be used in a grid connected PV system with BESS when the inverter is connected to dedicated loads either permanently or via a change-over switch when the grid is not available. A separate charger would be required to charge the batteries from the grid if required.



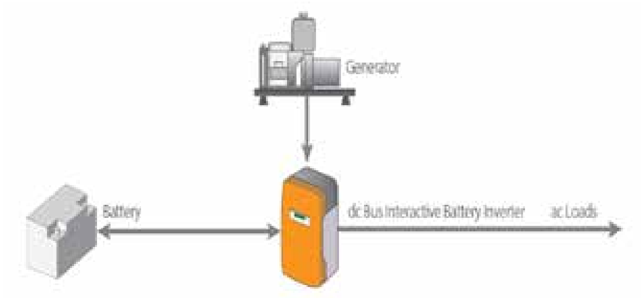
1.5. Inverter/Chargers

An inverter/charger has a battery system port, an a.c. input port for the grid (or fuel generator) and an a.c. output port for the loads. The inverter/charger has an inbuilt automatic changeover switch. When there is no a.c. power on the a.c. input terminal then the inverter operates as an inverter and the changeover switch connects the inverter/charger to the loads. When there is a.c. power present on the a.c. input port the inverter/charger will operate as a charger providing d.c power to the battery system while the changeover switch will connect the a.c. input power to the loads via the a.c. output port. These inverter/chargers are not designed to connect inverter output power onto the a.c. input terminal and therefore cannot inject power into the electricity grid.

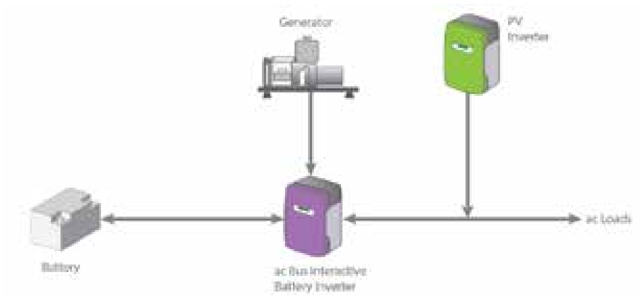


1.6. Interactive Inverter/Chargers

An interactive inverter/charger has a battery system port, an a.c. input port for the grid (or fuel generator) and an a.c. output port for the loads. The interactive inverter/charger has an inbuilt automatic changeover switch. When there is no a.c. power on the a.c. input terminal then the interactive inverter/charger operates as an inverter and the changeover switch connects the interactive inverter/charger output power to the loads. When there is a.c. power present on the a.c. input port, the inverter/charger will synchronise with the a.c. grid power so that the two power sources (grid and inverter) can operate in parallel providing power to the a.c. output load terminals. If the load peak demand is less than the inverter output rating then the interactive inverter/charger will switch to operate as a charger providing d.c power to the battery system while the changeover switch will connect the a.c. input power to the loads via the a.c. output port. These interactive inverter/chargers are not designed to connect inverter output power onto the a.c. input terminal and therefore cannot inject power into the electricity grid



(dc bus interactive inverter)



(ac bus interactive inverter)

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A strong track-record

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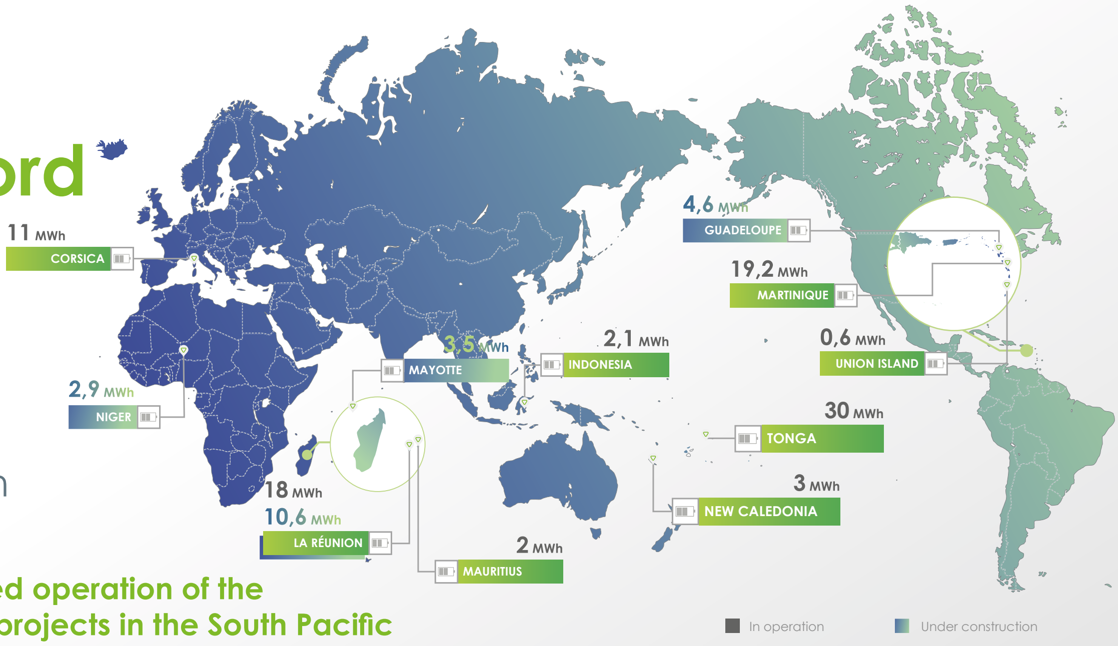
In operation

22 MWh
Under construction



Akuo successfully started operation of the largest battery storage projects in the South Pacific totaling 30 MWh in Tonga in the end of 2021!

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The Challenges of Energy Planning with Emerging Technologies in the Pacific

Dr. Iain MacGill and Dr. Rahman Daiyan
University of New South Wales

Energy planning

Energy system planning is challenging at the best of times, and these are not the best times with extraordinary volatility in fossil fuel prices and technology supply chains over the past few years, the ongoing impacts of the enormous wealth transfers between energy rich and energy poor countries seen during high prices, and worsening climate change impacts.

There is general agreement on desirable global energy pathways including greater electrification within many currently non-electricity sectors such as transport, and a greatly expanded role for renewables. However, there are also considerable uncertainties. Amongst these are technology uncertainties with promising but still unproven technologies including renewable hydrogen, carbon capture and storage, and ocean technologies.

Planning as anticipatory decision making

Energy planners have challenging decisions to make in the face of these uncertainties. Planning can be defined as anticipatory decision making, and hence involve commitments to irrevocably allocate valuable resources with consequences – hand waving doesn't count, although judicious delays in taking major decisions can.
Decision making frameworks often revolve around three questions:

- What objectives are you seeking to achieve? – lots of objectives for our energy sector given their vital social and economic role, with likely tradeoffs between objectives in clean energy transition
- What decisions are actually available to you? – differentiating between what exists and what is proven from what is likely available through to what might be possible.
- How these decisions are taken? – who are the decision makers, how do they actually decide, and with what autonomy and accountability.

The challenge of emerging energy technologies

Emerging technologies pose particular challenges for the question of available options in energy planning. All key decisions in energy planning involve risks – it is after all a forward looking activity in an increasingly uncertain world. And even well proven technologies can hold surprises when used in different contexts, or as technologies progress.

However, emerging technologies add to these risks – they are often not fully technically proven in an integrated manner (even if certain technology components are), haven't been demonstrated at scale in all potentially relevant jurisdictions, have uncertain economics given these technical uncertainties, may require other infrastructure with its own uncertainties, and could have unintended and potentially adverse wider societal impacts.

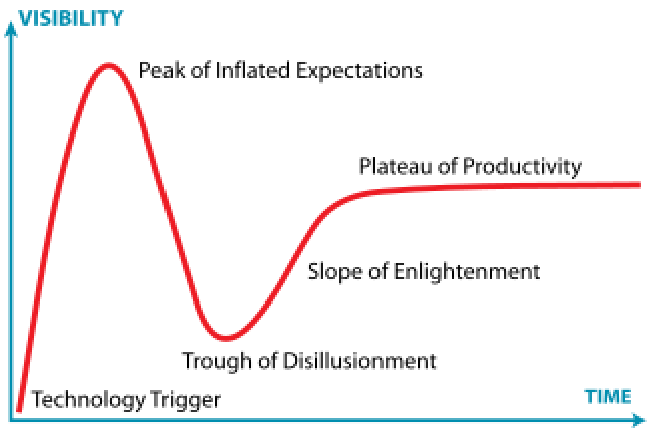
As they say, what exists is possible, and with well-established technologies you have the assurance of past experience. You also have at least some quantitative data on performance and economics and this data is a key input into the forward-looking planning tools such as electricity capacity expansion models that seek to cost different possible pathways.

Energy planning for the Pacific Islands is arguably easier than many other jurisdictions in the sense that some possible options aren't available at the relatively small scale and remoteness of the region's grids and other energy infrastructure. The region is also largely an energy technology taker, so can learn from the experiences of those jurisdictions which pioneer new energy technologies before they are deployed in the region, although we should note that there are some specific energy technology applications such as, for example, coconut derived fuels, where the Pacific is playing a leading role. However, energy planning in the Pacific might also be argued to be harder than for other jurisdictions given its very different circumstances to most of the world's energy sectors and these constraints on available choices. What is certain is that it's energy planners face the task of finding its own path to a clean energy future.

The example of green hydrogen

The potential role of green hydrogen in clean energy transition is one of the largest uncertainties facing energy planners around the world. In part the difficulty is hydrogen's extraordinary flexibility – as Michael Liebreich notes, it is the energy swiss army knife that can do everything from cleaning up chemical production, to providing gaseous and liquid e-fuels (methanol, even e-diesel and SAF) for transport from road to shipping and aviation. It can be burned for heat just like gas, oil and coal and, critically, store electricity via electrolyers and either fuel cells or suitably modified gensets.

This extraordinary range of possible roles has been one of the reasons for the extraordinary hype around green hydrogen over the past decade. However, it's never just a question of what you can do, but what you can do better than other options and the past couple of years has seen growing questions of green hydrogen's actual role. This can be expected – many promising technologies follow the technology hype cycle popularized by Gartner Associates - from growing interest as a technology's potential is explored, to a peak of inflated expectations, followed by a fall to the trough of disillusionment but then through, hopefully, to a slope of enlightenment that leads to appropriate expectations and commercial deployment in suitable applications. Certainly, we now have a growing appreciation that while green hydrogen could potentially do many things, it is unlikely to be our most appropriate option for many of them and the focus is now, rightly, moving to those applications where there are only limited alternatives.



The Gartner technology hype cycle (Wikipedia/wiki/gartner_hype_cycle)

For the Pacific, there are already a range of projects underway to

So, what can be done?

So, what can energy planners do about emerging yet still unproven technologies such as green hydrogen? And other possible clean energy options for the region including ocean technologies?

The first step is technology assessments. These are well understood and widely used approaches to reduce technology uncertainty. The OECD amongst others argues that good practice technology assessment requires them to be solution-centric rather than techo-centric, undertaken early and often to pick early trends and update them as technologies progresses, explicit on uncertainties and put community values and stakeholder engagement at the center of the process. These assessments typically have both global and regional perspectives given that technologies are highly international, but deployment is always in a particular context.

Such technology assessment may be combined with roadmapping to identify key steps for progressing the technology. In the case of green hydrogen in the Pacific, there has been early work including a study for Palau undertaken by IRENA. UNSW Sydney is now working with partners including PPA, SPC, USP and IRENA to undertake a hydrogen technology assessment for the region. It is focused on identifying key potential roles for green hydrogen is achieving the region's ambitious clean energy goals, and mapping out possible next steps. More details are available at www.pacificch2strategy.com.

For energy planning itself, there is a key role for scenarios in managing emerging technologies. Rather than betting your plan on the availability or absence of such a technology, your planning process can explore a number of scenarios to assess its potential impacts. You still have to make decisions, but scenarios can help you understand which decisions might keep possible future options open versus those than foreclose them and build a robust strategy that hopefully minimizes risk and regret.

A particular question for roadmapping and energy planning more generally is whether you want to be on the leading edge of technology development and deployment or a follower. The leading edge can all too easily become the bleeding edge, where failure occurs because an organization is too far out on the technology leading edge. One possible strategy between being a leader or follower is 'first to be second' where you look to be a fast follower once the technology has been proven elsewhere. This might be particularly appropriate for the pacific given its limited capacity to develop and deploy emerging and unproven technologies, yet ambitions to be leader in clean energy transition.

Finally, there is the question of rapid response to circumstances that lie outside formal energy planning. This can particularly include project proposals from private technology developers and deployers. There are numerous green hydrogen project proposals being pursued across the region. Commercially driven technology development proposals of this kind can be great driver of innovation and progress, and this has certainly been seen in the clean energy space. Such proposals do, however, carry some risks for not only the private players but also potentially governments and utilities. There are also other surprises, welcome or otherwise, that can arise and shake up energy planning. Covid was one example, so was the unprecedented fossil fuel prices in 2022 as a result of the energy market disruptions of Covid recovery and regional conflicts.

One possible approach for undertaking such rapid responses is the use of independent expert panels to help the region better understand the challenges as well as opportunities of unplanned and unexpected developments. An example was the Expert Panel to the Pacific Islands Forum which provided independent advice on the planned release of radioactively contaminated cooling water from the Fukushima Nuclear Power Plant Disaster. The region might benefit from a similar independent expert panel to assist with questions of the potential role of different energy technologies.

To conclude:

Emerging but still unproven energy technologies raise both challenges as well as opportunities for energy planners, including those in the Pacific. The region needs to focus on technologies available now for clean energy but be ready, willing, and able to deploy these new technologies if and as they become available. A range of measures can assist the pacific island countries and territories including ongoing technology assessments and roadmapping, the wider use of scenarios in energy planning, capacity building to be a fast follower when appropriate technologies are ready for deployment, and independent expert review to assist with rapid responses to emerging technology challenges and opportunities as they arise.

Fiji Submission to Climate Investment Funds on Renewable Energy Integration

Sustainable Energy Industry Association of the Pacific Islands (SEIAPI) Newsletter

On 3 October 2023, Fiji's Ministry of Finance held a Stakeholder Consultation Workshop on Fiji's Draft Renewable Energy Integration Investment Plan, which was to be submitted to Climate Investment Funds (CIF; cif.org) for consideration 6 October. SEIAPI Executive Committee member Peter Johnston was invited, participated, and on 4 October, provided written comments to the Ministry Finance.

The draft plan sought finance and technical assistance for investments to enhance the flexibility of Fiji's energy system that allow for the integration of variable renewable energy, and for greater access to renewable energy in areas with limited connectivity. There are two components: 1) to create a 'Green Energy Circuit' on Viti Levu, and 2) further electrifying the outer islands, plus a range of targeted technical assistance.

The draft plan should be available from: https://fijiclimatechangeportal.gov.fj/ppss/climate-investment-funds-cif-renewable-energy-integration-rei-investment-plan-ip/. If not it can be obtained from the SEIAPI Secretariat. The submission to the Ministry of Finance is available at SEIAPI.com. As there was insufficient time for the Executive Committee to review it, the submission is not formally from SEIAPI. The final plan as submitted to CIF is not yet online.

On 10 October, the CIF considered and endorsed Fiji's revised submission as summarised by the CIF below:

CIF Endorses Renewable Energy Integration in Fiji

Abridged and slightly edited from: https://www.cif.org/news/cif-endorses-100-million-energy-integration-costa-rica-and-fiji (10 November 2023)

The governing board of the Climate Investment Funds (CIF) has endorsed a wide-ranging investment plan to transform the energy system of Fiji and help enable the grid system to absorb and channel more clean power. The plan represents a first-of-its-kind effort, with funding in highly concessional capital to scale clean energy transmission solutions, enhance the flexibility of energy systems, and finance other efforts to make integrating renewable energy more flexible, cost-efficient, and resilient. Fiji received US$30.51 million (about F$68 million) as an initial allocation, funded through CIF's Renewable Energy Integration (CIF REI) investment program.

As a Small Island Developing State, Fiji wants to grow solar generation and has ambitious goals to achieve 100% renewable energy generation by 2036, with net zero annual GHG emissions by 2050. Fiji's plan, supported by the Asian Development Bank (ADB), the International Finance Corporation (IFC), and the World Bank, will help upgrade transmission lines and power stations throughout the country, create new solar plants on Fiji's largest island, provide technical assistance on energy grids and systems, and finance the electrification of outer islands — bringing electricity access to rural communities. At full implementation, Fiji plans to increase renewable energy generation capacity by 40 MW and provide an additional 91,104 MWh of renewable energy output per year by 2026; connect 200,000 people to the grid; provide 7,000 Fijians on the outer islands with more affordable, reliable, and clean energy by 2026; and reduce emissions by 50,000 tCO_2e per year by 2026.

Women Can Lead the Pacific's Power Transition

Helle Buchhave, PWIP Task Team Leader and Senior Social Development Specialist
World Bank

Joana Didura, a young Electrical Apprentice Technician with Fiji Energy Limited, believes that the energy sector will not remain a male dominated field.

STORY HIGHLIGHTS

- *The World Bank Pacific Women in Power Program is helping transform the Pacific energy sector, boosting women's roles in engineering and leadership. Launched in 2023, it challenges norms and fosters advocacy for gender equality.*

- *Women's employment is crucial for economic growth in the Pacific and potential benefits of better gender equality in the energy sector include better financia performance, innovation, safer environments, and improved retention in the sector.*

- *Despite existing challenges, a new generation of women is emerging in the Pacific's energy sector. From Graduate Electrical Engineers to Mechanical Engineering Students, these women are driven by a passion for addressing pressing issues like climate change.*

In the Pacific, an area highly vulnerable to climate change, a significant transformation is underway in the energy sector. This change encompasses advancing towards a climate-aware energy industry and challenging and reshaping existing gender norms in the energy workforce.

The Pacific Women in Power (PWIP) Program

This transformation is supported by the World Bank through the Pacific Women in Power Program (PWIP), which is being implemented in collaboration with the Pacific Power Association and the Pacific Community. Officially launched in May 2023 at the 5th Pacific Regional Energy and Transport Ministers' Meeting in Vanuatu, PWIP is an extensive innovative initiative dedicated to enhancing women's roles in engineering, science, and leadership within the energy sector that has received groundbreaking endorsement from energy ministers and energy utility leaders from across countries in the Pacific.

PWIP's comprehensive goals include building evidence and data-driven business cases and targets, engaging champions for advocacy, developing multi-year skill and employment programs, and enhancing capacity building and knowledge management across different groups in the sector. These efforts aim to bolster women's employment and economic empowerment in the energy sector.

Economic Impact of Gender Equality

World Bank research has found that closing gender employment gaps could increase GDP per capita by up to 22 percent in the Pacific. © World Bank

Female labor force participation across most of the Pacific countries is low. The World Bank highlights the broader economic benefits of gender equality, estimating that long-term economic growth per person could on average be 22 percent higher, for the Pacific region, if women's employment rates matched men's.

There is also a strong business case for gender diversity at work, with research showing better financial performance, greater innovation, safer operating environments, and improved employee retention.

These are benefits that energy sector utilities in the Pacific are determined to realize. However, challenges remain.

Helle Buchhave, a Senior Social Development Specialist who leads the World Bank-implemented PWIP, provides insight into the program: "As a part of the Pacific Women in Power Program, we are gathering data and helping clients design and invest in future and current innovations, partnerships and policies, to increase women's participation in the energy sector."

Preliminary findings of data gathered across 14 Pacific energy utilities reveal that only 18 percent of the labor force is female, and only 10 percent of engineers are women. Buchhave emphasizes that this under representation of women risks reinforcing the norm that the energy sector is more suited for men, which could lead to a reluctance among both employers and female students and their families to consider the energy sector as a viable workplace for women.

Voices from the industry

Industry leaders also echo the importance of PWIP's objectives and recognize the challenges they need to overcome. General Manager of Customer Services Droumand Rupert and Deputy CEO Delilah Homelo from Solomon Power, note that geography and isolation in Solomon Islands make it difficult for women to work 'out in the field', with their families not accepting this work away from the home. "We must work on these sorts of social barriers, possibly with proper out-station housing and safety procedures in place for women that address safety and social concerns," Rupert says.

According to Homelo, there are few to no women who apply for jobs. "We are missing out. We need to get more women exposed to the work available at our company, particularly in renewable energy," she said. "If there are role models, we must promote them to show young women and girls that if she can do it, you can too."

Currently only 18 percent of the labor force in the Pacific energy sector is female. © World Bank

Finau Moa, Acting CEO for Tonga Power Limited, believes the growing emphasis on renewable energy resources provides new opportunities for women's participation in the sector. Moa believes that inclusive policies and recruitment practices are critical: "It's timely now to move forward with inclusive policies and recruitment practices. No more discrimination – we want to see everyone as equal."

Actively reaching out to women needs to be a key strategy for inclusion says Nixon Anson, CEO of the Pohnpei Utilities Corporation. "In our culture and laws, there are no barriers to women working in the energy sector. However, we recognize that our efforts in outreach and education to support women's inclusion have not been sufficient," Anson explains. He emphasizes there is a commitment to change: "We are dedicated to training women and actively communicating within our communities the vital role women can and should play in our sector."

Electricity utility 'Te Aponga Uira' in the Cook Islands serves as a good example of promoting gender quality in the sector. Board member Donald Buchanan says that strategic leadership has played a pivotal role in fostering gender balance: "The change is set from the top, and as a board, we set our goals to guide organizational culture, including to support opportunities for women and men in the energy sector. This approach demonstrates how leadership commitment, and a national framework can drive meaningful progress towards gender equality within energy utilities."

Inspiring the next generation

Despite these challenges, a new generation of women is emerging in the Pacific's energy sector.

Fuimaono Sarafina Lesa, a Graduate Electrical Engineer at Samoa's Electric Power Corporation chose a career in energy because it's at the forefront of addressing her generation's pressing issues, from climate change to sustainable development. "I've always been fascinated by the potential innovation in this field. As an engineer, I am able to be a part of the solution, to drive and make impactful change through new technologies."

As the only woman in her class, Silvia Halofaki, a Mechanical Engineering Student at the University of the South Pacific, says it can be challenging. "When I look around, I don't see any other women in my class, and it's not easy trying to work alongside only boys," she says.

Policies supporting gender balance and actively promoting female role models in the sector is important says Tupou Falemei Fale, Human Resources Manager for Tonga Power Limited: "I also see opportunities to highlight our champions – some of the great women working as engineers at Tonga Power – and go out to schools to encourage students to pursue careers with us."

Frederic Petit, Managing Director of UNELCO in Vanuatu, agrees, and speaks highly of their female engineers: "They are still a minority but are highly capable and very conscious of compliance and safety."

Support for Gender Equality and Investment in STEM

To help more women choose a similar path, Hon. Lynda Tabuya, Fiji's Minister for Women, Children and Poverty Alleviation, speaks passionately about the need for systemic change to create more pathways for girls and women, both in education and in the workplace: "We need to encourage our women and girls to participate equally as we're looking at the future of work." She identifies significant challenges, including hiring discrimination and unequal pay, which must be addressed to create a level playing field. "It's discouraging, but it is up to us to tackle these issues," she asserts.

More women in the Pacific energy sector will play an important role in the sector's growth and transformation. © World Bank

Gordon Chang, Executive Director of the Pacific Power Association, stresses the importance of fostering interest among women and girls in STEM (science, technology, engineering, and mathematics) fields. He articulates a clear vision for this initiative: "We should work with high schools and universities to attract more females into the sector, and we're excited to partner with the World Bank's Pacific Women in Power Program to do this," Chang said.

Conclusion

The Pacific Women in Power Program represents a significant step towards transforming the energy landscape by promoting gender equality and creating employers of choice across the sector. "We want this program to have some really practical outcomes to help shift the dial in the Pacific energy sector to enhance equality for women" says the World Bank team leader, Helle Buchhave. "This journey, while filled with challenges, is also a journey of hope and opportunity, not only addressing current gender disparities but also setting a precedent for the global community."

Stephen N. Ndegwa, World Bank Country Director for PNG and the Pacific says the Pacific Women in Power Program is about more than equal representation. "It's about harnessing the full potential of women's leadership and innovation in the Pacific's energy sector, inspiring similar efforts worldwide, and paving the way for women's jobs, now and into the future."

GPA's Strategic Advances: Bridging Guam's Energy Gap as Ukudu Plant Nears Completion

Guam Power Authority

The Guam Power Authority (GPA) is making significant strides in its ongoing efforts to underscore GPA's commitment to addressing the capacity shortfall, ensuring a more reliable and stable power supply for the island. Recent developments, include the approval of two resolutions by the Consolidated Commission on Utilities (CCU),

CCU Approval for 54 MW Boost in Energy; Petitions Advance to the PUC

The CCU's recent approval of two resolutions marks a crucial step forward in GPA's multipronged approach to meet Guam's growing energy demands. These resolutions pave the way for projects that will collectively add 54 MW to Guam's grid over the next 6-9 months.

Key projects include:

- Adding 20 MW capacity of temporary power by April/ May 2024 (pending PUC Approval); and
- Increasing 14 MW capacity of existing Cummins diesel units located at Yigo site by May 2024; and
- Restoring 20 MW capacity of Yigo Diesel units to be placed adjacent to the Tenjo Vista Plant by September 2024 to serve the southern community.

These strategic moves align with commitment to reducing the risk of load shedding and eliminating the need for increased costs. The addition of capacity will result in fuel savings over time, which can be passed on to ratepayers.

Recognizing the necessity and urgency, GPA solicited for emergency temporary power. Aggreko was selected as the most qualified and responsive vendor, with negotiations completed for contracting 20 MW of temporary power within 100-days upon award. GPA also negotiated the assessment and repair of up to 18 Yigo Diesel units to restore an additional 14 MW of capacity at the Yigo Diesel site.

Additionally, GPA has identified an alternate site adjacent to the Tenjo Vista Power Plant to site up to 20 MW of additional capacity, since the area has access to transmission lines which can accommodate an additional 20 MW of power to export to the grid to serve the southern villages and Naval Station Guam. This project includes relocating, installing, commissioning, operating, and maintaining these units. The estimated cost for capacity restoration is $5 to $7 million, with annual operating costs of $2-3 million.

General Manager John M. Benavente, P.E., stated, "We are pleased to see the CCU's endorsement for our short-term projects, which are crucial in addressing the challenges affecting power generation on Guam. We will continue to find innovative solutions to ensure a reliable and sustainable power supply for our community as we bridge the gap to the commissioning of the Ukudu Power Plant. We appreciate the continued understanding and cooperation of our customers as we work towards a brighter energy future for Guam."

Beyond the CCU-approved projects, GPA continues its multi-pronged work on additional capacity increasing projects. Customers are encouraged to visit GPA's website and social media pages for the latest updates.

Precautionary 1-Hour Rotating Schedule Extended for February 2024

GPA Urges Continued Power Conservation and Preparedness

The recent progress in temporary power procurement signifies our commitment to ensuring a reliable power supply. Despite minimal outages in January, the extension of the precautionary schedule is a proactive measure to ensure our customers can prepare for any potential outages.

General Manager John M. Benavente, P.E., stated, "We are not out of the woods yet, so I continue to urge residents and businesses to continue to implement power conservation plans, especially during peak hours between 5pm - 11pm."

GPA continues to encourage customers to conserve energy during peak hours, emphasizing the importance of preparedness for the upcoming hotter months.

Load Shedding Data as of January 31, 2024

GPA provides data on load shedding for transparency:

MONTH	AVG. HRS./FEEDER	DAYS OF OUTAGES
Sep 2023	5.8	20
Oct 2023	2.3	11
Nov 2023	5.9	9
Dec 2023	0.9	4
Jan 2023	1.1	5

Guam Power Authority implements LEAC Adjustment as Approved by the PUC:

GPA Absorbs $30.4M in Under-recovered Costs with Steep Fuel Prices

On January 25, 2024, the Public Utilities Commission voted on a slight increase to the Levelized Adjustment Clause (LEAC), or fuel surcharge. The three-cent increase, from $0.23 to $0.26, translates to approximately $30.85 for residents who average 1,000kWh per month.

General Manager, John M. Benavente, P.E., stated, "It is never easy to recommend an upward adjustment because we are always mindful about the financial strain it places on our customers.

The three-cent increase is intended to support GPA's continued need to purchase expensive fuel amidst continually rising oil costs." GPA has absorbed $30.4M in fuel costs as of December 2023, which will be spread out over a longer period, or under-recovery, shielding its customers from drastic and steep increases in fuel costs.

Benavente adds, "While the oil market and global events impact the fuel surcharge, GPA has not increased its cost to run its operation, we have maintained our base rate at $0.10 since 2013. Our priority is to keep our long-term goals for cleaner, reliable and more affordable energy. The sooner we can reduce our reliance on fuel, the sooner we can reduce power bills."

Additionally, the PUC supported GPA's efforts to meet its goals for more renewable energy and ensuring the functionality of customer water wells, sewer systems, and pump stations during disasters. GPA looks forward to petitioning the PUC in advancement of recent milestones to address the shortfall in generation capacity. Updates will be provided regarding this petition on GPA's website and social pages.

As Power Credits Conclude, Prepare Your Home Ahead of Guam's Hotter Months

As the hotter months approach, customers are reminded about the conclusion of the Prugråman Ayuda Para I Taotao-ta Energy Credit program. With the last increment of $100 credits applied to all residential and commercial accounts, totaling $300 for October through December 2023,

Continued Energy Conservation Efforts

In light of the program's conclusion and ongoing efforts to enhance the Island-Wide Power System (IWPS), GPA encourages households and businesses to implement energy conservation plans, both on and off peak hours.

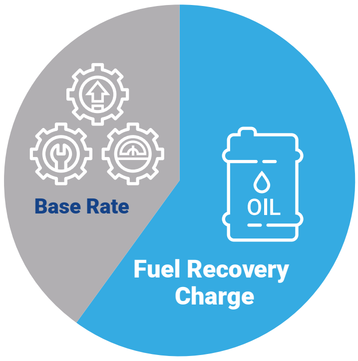
Practical Energy Conservation Tips

Below are practical tips for residents to prepare their homes for the upcoming hotter months:

- Apply Reflective Coating on Roofs: Reflective coatings on roofs can reduce the absorption of heat, keeping homes cooler and decreasing the need for excessive air conditioning.
- Service A/C Units: Ensure your air conditioning units operate efficiently by scheduling a professional service before the temperature rises, optimizing their performance.
- Upgrade to Energy-Efficient A/C Units: Consider replacing older, less efficient A/C units with energy-efficient models. This not only reduces energy consumption but also contributes to long-term cost savings.
- Seal Leaks around Windows and Doors: Prevent hot air from entering and cool air from escaping by sealing any leaks around windows and doors with weather stripping or caulk.

The **"fuel recovery charge"** is a pass-through cost that is tied to the price of oil and can make up 2/3 of your power bill.

The **"base rate"** portion of your power bill pays for utility



upgrades, maintenance and operations.

Scan the QR code to learn more about the fuel recovery cost (LEAC)

Ensure your air conditioning units **operate efficiently** by scheduling a professional service before the temperature rises, optimizing their performance.

By adopting these energy-saving practices, residents of Guam can not only lower their energy bills but also contribute to the overall conservation efforts on the island. As GPA continues to work towards a more sustainable energy future, the collaboration of the community becomes increasingly vital in ensuring a resilient and efficient power supply.

Financial Assistance Programs Available

With the conclusion of the Energy Credit Program, GPA emphasizes that customers facing financial challenges can explore assistance programs such as the Department of Administration's Emergency Rental Assistance (ERA) Program and Guam's Homeowner Assistance Fund (HAF) Program. For guidance on applying for financial aid, customers can contact GPA's customer service team at (671) 647-5787 or visit DOA's website.

Nauru's 6MW ADB Solar Development Project Update

Nauru Utilities Corporation

Introduction

The Republic of Nauru, referred to as "Nauru", is a Pacific Island country, has approximately 13,000 residents. It predominantly sources its energy through diesel power generators. About 8% of its current energy demand is sourced from renewable energy - solar Photovoltaic (PV) installations. The Government of Nauru has a target to increase the annual energy renewable penetration within Nauru to 50%. Based on the Nauru Solar Power Expansion Plan, the construction of 6 MW solar farm coupled with 2.5MWh/5 MWh of battery storage is designed and is currently under construction. The demanded facilities include a 6 MW (nominal installed AC capacity) Solar Farm. A Battery Energy Storage System (BESS) with a capacity of 2.5 MWh / 5 MWh and an 11 kV Substation, including all switchgear, power transformers and connection to the existing NUC 11 kV distribution system. The completion of this project assumes 48% solar contribution to Nauru's energy demand.

Project Aim

The aim of the Nauru Solar Power Development project is to:

- Increase the supply of reliable, cleaner electricity for Nauru.
- To decrease the cost of power supply through replacing diesel-generated power with solar generated power.
- Reduce greenhouse emission through development of renewable energy
- Provide stability of power supply throughout the day.

Project Status

Key milestones dates identified in the baseline program and most recent program are shown in the table below.

Milestone	Baseline Program	Current Program
Project commencement	August 3, 2020	January 13, 2021
Completion of detailed designs	October 7, 2020	February 30,2023
Procurement commences	August 10,2020	May 11, 2021
Equipment arrival in Nauru	December 20, 2020	December 9,2023
Works commence at site	December 10, 2020	December 3,2021
Commissioning commences	April 13, 2021	November 1,2023
Practical completions	August 3, 2021	31 July, 2024

The project contractors and all stakeholders are working persistently for a practical completion date set at 31 July 2024.

Construction

Civil works has been completed. The only remaining construction activity at the site is the installation of the BESS inverters, installation power transformers and installation of electrical switchgears.

We have now completed 67% of the project and aim to complete the remaining 33% by July 2024

Pictorial report

Increasing Access to Renewable Energy Project

Mafalu Lotolua, General Manager
Tuvalu Electricity Corporation (TEC)

Currently, 19% of the energy mix in Tuvalu is derived from solar sources (16% in Funafuti and 60-70% in the outer islands)

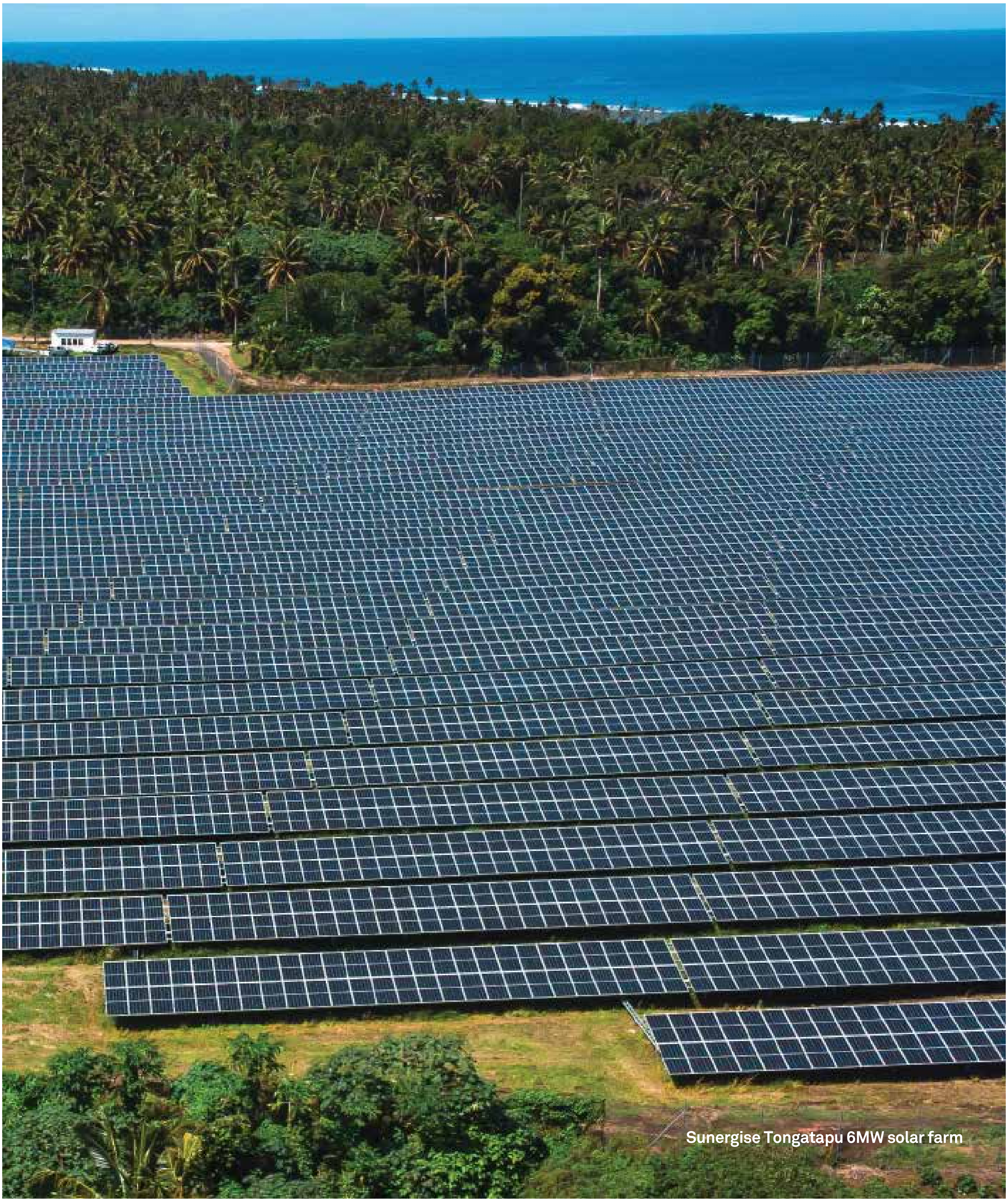
The Government of Tuvalu through the Tuvalu Electricity Corporation (TEC) received funding from the Asian Development Bank (ADB) for the implementation of the utility renewable energy project title "Increasing Access to Renewable Energy Project (IAREP).

The project is to install 500kW rooftop solar photovoltaic; 3MWh storage; and associated modern control systems on Funafuti. The output will enable Funafuti to reach 32% renewable energy penetration.

For the Outer Islands; the installation of climate-resilient ground-mounted solar photovoltaic system to achieve >90% renewable energy contribution. The output includes: (i) 44.8kWp solar photovoltaic capacity for Nukulaelae; (i) 78.4 kWp solar photovoltaic capacity for Nukufetau; (iii) 100.8 kWp solar photovoltaic capacity for Nui; and (iv) associated modern control systems.

The project is expected to displace 6.7 million liters of diesel fuel over the project lifetime and avoid 17,800 tons of carbon dioxide equivalent (CO2e) GHG emissions over its lifetime.

The project is under construction by CBS Power Solution Pty Ltd, a Fiji based company. The construction work is about 70% and it is envisaged that May/June 2024 will complete construction work.



Sunergise Tongatapu 6MW solar farm

Welcome!

to the New Allied Members

Four (4) new Companies have joined the PPA as Allied Members since our last PPA Magazine.

The new Allied Members are:

SUSTAINABLE ENERGY INDUSTRY ASSOCIATION OF THE PACIFIC ISLANDS: Sustainable Energy Industry Association of the Pacific Islands is based in Suva, Fiji. Their primary activity is creating an enabling environment for the growth of sustainable energy business entities and technologies and their applications in the Pacific Islands .

SELECTRONIC AUSTRALIA PTY LTD: Selectronic Australia Pty Ltd is based in Victoria, Australia. Their primary activity is the manufacturer of SP PRO multi-mode inverters, Certified PV inverters and supporting products. Their secondary activity is microgrid design and implementation.

GEOGAS PACIFIC PTY LTD: Geogas Pacific Pty Ltd is based in New South Wales, Australia. Their primary activity is LPG distribution.

VISION INVESTMENT LIMITED T/A VISION ENERGY SOLUTIONS: Vision Energy Solutions is based in Suva, Fiji. Their primary activities are retail, engineering, procurement, and construction. Their secondary activity is energy audit, design, and consultations.